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NOEL (P.). *Les ennemis des Radis.* [The Enemies of Radishes.]
—Bull. Lab. Rég. Entom. Agric., Rouen, 1913, pt. 3,
pp. 15-16.

Radishes can be grown in France for 11 months of the year if proper care and skill be used. The author gives the following list of insect pests.

COLEOPTERA: *Ceuthorrhynchus boraginis*, F.; noted as a pest by Kaltenbach. *C. assimilis*, Payk., perforates the pods and gnaws the seeds. *C. pleurostigma*, Marsh., causes galls on the roots. *Phyllotreta nemorum*, L., makes innumerable small holes in the leaves. *Psylliodes chrysocephala* makes holes in the leaves.

RHYNCHOTA: *Aphis crysimi*, Kalt., sucks the stalks of the seed-plants. *A. brassicae* sucks the stalks, petioles and leaves.

HYMENOPTERA: *Athalia spinarum*; the larvae frequently eat the leaves entirely in the spring and again in August and October.

LEPIDOPTERA: *Pieris brassicae*, L.; the larva eats the leaves in June, July and August. *P. rapae*, L.; the larva eats the leaves all the year round. *P. napi*, L.; the larva also eats the leaves all the year round. *P. daplidice*, L.; the larva eats the leaves in June and September. *Botys marginalis*, Hb.; the larva eats the leaves in September.

DIPTERA: *Anthomyia floralis*, Mg.; according to Bouché this larva attacks the plants in July. *Dasyneura raphanistri*, Kieff., causes swellings of the buds. *Diplosine* sp. causes swellings of the pods.

BALLOU (H. A.). Notes on Insect Pests in Antigua.—Bull. Entom. Research, iv, pt. 1, May 1913, pp. 61-65, 2 pls.

The principal object of the author's visit to Antigua in December 1912 was to study an outbreak of the twig-borer of limes. The attack of the insect apparently always begins on a small twig, and the larva then eats its way into the branch from which the twig springs. This branch is always more or less girdled by the tunnel of the grub, and the entire life-cycle is passed within the outer dead portion, though it seems probable that the insect begins to feed on living wood. The branch soon breaks, and the injury is so conspicuous that it is quite easy to cut off and burn the affected twigs. The author thinks that this practice would so far reduce the numbers of the insect that it would no longer be a pest, although it might at first cause some small loss and damage to the trees.

The habits of the twig-borer are different from those of the bark-borer (*Leptostylus praemorsus*), which has at times been plentiful in Dominica and is known to occur in several other islands. This insect lives entirely under the bark, the attack generally beginning near a point of injury, caused by bad pruning or otherwise, and as a rule on the larger branches or main stem and often near the level of the ground. The twig-borer works higher up the tree, rarely attacking branches more than 1 inch in diameter. In several localities the orange-red scale

or California red scale (*Chrysomphalus (Aspidiotus) aurantii*) was found to be present in such numbers that young lime trees were being killed by it, and it was also causing serious injury to old trees. The author notes that the scales generally cover the lime fruits before the attack on the leaves and branches is serious enough to attract the attention of a casual observer. He thinks that this scale develops much more rapidly under dry than under moist conditions. The lime fruits split open and are spoilt, and the author believes this insect to be the cause of the most serious injury from which the limes are suffering.

He agrees with the general experience of cultivators that limes overgrown with creepers are generally free from scale, even though grown close to badly attacked and unhealthy trees. Wherever red scale was abundant in Antigua two Coccinellids were present in quantity, namely, *Cyclonedea sanguinea* and another minute black or bluish black species, not larger than a pin's head.

The author took the opportunity of examining cotton for the flower-bud maggot, but none was found, though it was reported soon after his departure. The boll-worm has done considerable damage and the author suggests sending children into the cotton to collect all attacked bolls, and that these should be destroyed by being turned into the cattle pens. He further suggests the planting of corn through the field as a trap crop.

Cassava was found to be attacked by the larvae of the common Sphingid moth, *Dilophonota ello*. These larvae are dimorphic, being either green or purple, and it has been found that they remain so until fully grown. Cassava was also attacked by a lace bug (*Corythucha* sp.), and sweet potatoes by the larvae of a butterfly, probably *Precis lavinia zonalis*, Feld., the only species of the genus known as yet from Antigua. Cow-peas were attacked by a boring larva in exactly the same manner as those found in Barbados in 1911 from which a new species of moth was reared. A predaceous bug (*Zelus rubidus*) was also observed in large numbers on those plants attacked by the woolly pyrol moth (*Thermesia gemmatalis*).

NEWSTEAD (Prof. R.). Notes on Scale-insects (Coccidae). Pt. I.—
Bull. of Entom. Research, iv, pt. 1, May 1913, pp. 67-81.

The Coccoids described in this paper are chiefly from Uganda and Zanzibar, seven of them being new species. *Icerya purchasi*, Mask., and *Lepidosaphes beckii*, Newm., are recorded from citrus trees in Zanzibar, this being a new locality for the former; *Pseudococcus obtusus*, Newst., from mango in Zanzibar; *Ceroplastes ugandae*, Newst., *Saissetia nigra*, Nietn., and *Aspidiotus gowdeyi*, sp. nov., from *Anona muricata*, in Uganda; and *Leucaspis riccae*, Targ., from olives, in Egypt, whence it has not been previously recorded. It is noted that all the specimens of *Saissetia oleae*, Bern., received from an unnamed indigenous tree in Uganda had been attacked by Chalcidid parasites.

WATERHOUSE (C. O.). On a new species of Mymaridae from Trinidad.—*Bull. Entom. Research*, iv, pt. 1, May 1913, p. 87.

The author describes a new species of MYMARIDAE, *Anagrus flaveolus*, forwarded to the Imperial Bureau of Entomology by Mr. P. L. Guppy, Assistant Entomologist to the Board of Agriculture, Trinidad, who bred it from eggs of the corn leaf-hopper *Peregrinus* (*Delphax*) *maidis*.

SCHNEIDER-ORELLI (O.). Untersuchungen über den pilzzüchtenden Obstbaumborkenkäfer *Xyleborus* (*Anisandrus*) *dispar* und seinen Nährpilz. [Investigations on the fungus-growing Scolytid *Xyleborus* (*Anisandrus*) *dispar* and its symbiotic fungus.]—*Centralbl. Bakter., Paras. & Infekt.*, 2. Abt., xxxviii, no. 1-6, 1913, pp. 25-110, 7 figs., 3 pls.

This paper is a critical and detailed study of the bionomics of *Xyleborus dispar* and contains the results of numerous experiments regarding the feeding habits of this orchard pest. In contrast with the great number of different bark-beetles infesting forest trees, only four species of Scolytidae are injurious to fruit trees in Central Europe:—*Scolytus pruni* and *S. rugulosus*, belonging to the physiological group of 'bark breeders' or, according to Nüsslin, to the subfamily ECCOPTOGASTERINAE, and *Xyleborus saxeseni* and *X. dispar* to the 'wood-breeders' or XYLEBORINAE. A comparison of the mouth-parts of the adults and larvae of the latter species shows that the adults are provided with more powerful biting organs than the larvae, which corresponds with the fact that the adults alone do damage by boring, whereas the larvae browse on the fungi covering the walls of the burrows. Some excellent photographs are given showing the mouthparts of larvae and adults of *X. dispar* and *S. pruni*, and the pattern of the excavations made by the four species of Scolytid orchard pests. The difference in the feeding habits of the adult and larval *X. dispar* corresponds with differences in the structure of the alimentary system, the most conspicuous being the absence, in the larvae, of a gizzard. In discussing the structure of the female genital organs the author records the deposition of ova fertilised by spermatozoa that had been retained in the receptaculum seminis for more than six months after copulation.

If, during the winter, the burrows of *X. dispar* are carefully opened they reveal the hibernating females and males all lying one behind the other with their heads directed to the inner part of the burrow. No eggs, larvae or pupae are to be found. The fertilised females usually leave their hibernacula in April and May, and start making a new burrow elsewhere. The males are incapable of flying, and contrary to H. B. Hubbard, the author is unable to confirm the existence of 'bachelor colonies,' or the assertion that the males are liable to be suffocated by the rapidly growing fungus investing the walls of the burrows. The period of the migration of the females may extend to more than two

months, according to climatic conditions; in Switzerland the foundation of the new colony may take place at such intervals as to suggest the occurrence of a second generation in one year. The author did not succeed in determining the time taken for any particular migration from tree to tree, but under laboratory conditions the infestation of a new tree takes place the same day that the tree of hibernation is abandoned. Frequently several females were observed to migrate at the same time and settle on the same tree. The earliest date on which the migration takes place is on April 19th. In May 1912 some females of *X. dispar* were caught in a vineyard in a trap intended for vine-moths, and as no Scolytids had ever been previously found on the vines it was evident that they had come from an orchard several hundred metres away. The fresh bore-holes are easily perceived owing to the white frass that trickles down the side of the tree. The female does not wait till the system of tunnels is completed, but oviposits as soon as one horizontal burrow with one vertical branch has been tunnelled out. The lateral tunnel containing the eggs is temporarily closed by a wad of damp frass, which induces the hygroscopic conditions favourable to a luxuriant growth of nutrient fungus. The earliest date on which eggs were found by the author was May 10th, but the majority are laid in the second half of that month, and tunnelling ceases entirely in the beginning of June. The eggs are usually laid in clusters of six, chiefly at junctions of the tunnel-system, and only rarely are they to be found in one of the blind branches. The number of eggs laid by a single female seems to depend on the nature of the wood, varying from 6 to 45. They hatch a few days after, so that the first-made tunnels may contain larvae long before the mother has finished her burrowing operations. The pupal stage lasts from 10 to 14 days and the young beetles winter in the tunnels. The mother is generally dead by the autumn. Notwithstanding the small number of males, all the females are fertilised by the autumn, and as copulation continues in spring to the time of migration of the females, the author concludes that the latter receive the spermatozoa for storage in the receptaculum seminis more than once. In discussing the number of generations in one year the author criticises previous observers and maintains that, without exception, at least in Switzerland, only one generation occurs.

The chapter devoted to the symbiosis of *Xyleborus dispar* and its food-fungus *Monilia candida* (pp. 52-85) deals with the author's experiments on the propagation of the fungus, a discussion of the systematic position of the latter and a comparison with other fungus-growing insects. During the greater part of the year the walls of the tunnels of *X. dispar* are black, as if charred, which never occurs in those of the 'bark-breeders.' Soon after the mother-beetle has finished burrowing, the walls of the tunnels, with the exception of 2 to 3 mm. near the outer opening, become covered with a growth of a fungus differing from that of *X. saxeseni*, and the beetle removes the wad of frass, mentioned above, as soon as the fungus is in a satisfactory state for the larvae. Although other species of fungi occur, the

symbiotic fungus preponderates to such an extent as practically to constitute a pure culture. By his numerous experiments the author is forced to the conclusion that the mother-beetle always carries a supply of living fungus spores in her gizzard, which are not used for nourishment and which may remain undigested and capable of germination for more than $2\frac{1}{2}$ months. The spores must be taken into the alimentary canal by the adult beetle before migration, and thus spread to the new home.

After a lengthy and detailed discussion of the predisposition of fruit trees to attacks of *X. dispar*, the author emphasises the fact that he has never yet found an infested tree that did not show other primary injuries or disease, e.g., wounds, roots gnawed by mice, pruning, effects of frost. All influences sapping the vitality of the tree, even if only temporarily, such as root and other pruning, renders it more liable to the attacks of the beetle—by attacks being meant colonisation. It is the horizontal tunnels of *X. dispar* which prevent the upper parts of the tree from receiving sufficient water and nourishment and so cause it to dry up. Epidemics generally last for two or three years. Additional damage is done to the trees by the fungus, which, by circulating through them, causes their death within a few years.

The methods of controlling the pest are many. It is advisable to destroy the mice that gnaw the roots of the fruit trees, to plant strains that are resistant against frost, to avoid accidental abrasions and other injuries and, what the author found to be an effective preventive measure, to leave a few twigs unpruned in order to regulate the flow of the sap. Trees pruned in this manner are far less liable to attacks from *X. dispar* and recover more rapidly from the effects of pruning. The painting of trees with carbolineum, so far from preventing the beetle from colonising, often weakens the tree and has the opposite result to that desired. At the Swiss Experimental Station in Wädenswil it was found that the cheapest and most effective way to protect young fruit trees from the ravages of the beetles is to wrap the trunk and main branches with cloth or sacking. The method employed against Scolytids by foresters of placing upright poles in the ground as decoys, might be used against *X. dispar*. Perhaps traps, such as are used for catching vine-moths might be used to some advantage. Trees already infested are best treated by squirting paraffin oil or carbon bisulphide into the bore-holes (the latter being the more effective insecticide), and by closing up the entrances with clay, tar or wax. Paraffin oil kills the beetles near the periphery; whereas a wad of cotton-wool dipped in carbon bisulphide and introduced into the opening, wrapped round a piece of wire or a match, has the effect of killing off the beetles, larvae and pupae in the interior. Moribund trees ought to be used as firewood and care taken to sweep up and burn all chips and litter after chopping up the wood.

Some very clear micrographs of the symbiotic fungus are shown in the plates, and the memoir contains copious references to other papers on the subject. The author gives a résumé of known facts with regard to fungus-cultivating insects.

SMITH (R. I.). Report of Work on Corn Bill-Bug (*Sphenophorus callosus*).—35th Ann. Rep. of the North Carolina Agric. Expt. Stn., 1911-1912, Raleigh, N.C., 1913, pp. 105-135.

During the spring of 1910 corn bill-bugs were reported as doing an unusual amount of damage in Camden and other coast counties. Further damage was observed in June, 1910, in corn-fields and in a rice-field in Columbus and Robeson counties. During July and August, bill-bugs were found breeding in Elegant Nutgrass (*Cyperus flavicomus*). A careful study of their seasonal life-history revealed that eggs are first laid about 20th May on corn plants or the larger species of *Cyperus* and possibly on other sedges. The eggs require an average of six days for hatching, and egg-laying continues until the latter part of September. The larvae feed in the stalk or root of the plants and become full-grown in an average period of about 33 days. Larvae of all ages occur from June until the end of November, but the majority are full-grown before 1st November. The pupae are found in cells in the stalk of the food-plant or in the soil underneath the roots. Nine days is the average duration of the pupal stage. The beetles mature and usually emerge and feed from the beginning of July until the beginning of November. These beetles frequently do not mate and lay eggs until the following spring, after emerging from their winter quarters in the soil or under litter or, occasionally, in the corn-stalks.

SMITH (R. I.). Biological Record of Little Grass Bill-Bug (*Sphenophorus parvulus*).—35th Ann. Rep. of the North Carolina Agric. Exper. Stn., 1911-1912, Raleigh, N.C., 1913, pp. 136-140.

The little grass bill-bug is not a serious pest in North Carolina, though it may do more damage than is supposed. In May 1911, one fertile female was found in a cornfield and confined in a jelly glass where it was fed on sections of green corn-stalk. Between 19th May and 7th October 245 eggs were laid, and seven eggs was the greatest number laid in any 24 hour period. The average incubation period during warm summer weather is six days, or about the same time required for eggs of *Sphenophorus callosus*. During the cooler weather prevailing at the end of September, some eggs required 11 days to hatch. The larvae immediately after hatching were carefully placed on a corn-stalk, and the larval stage for seven specimens recorded varied from 31 to 60 days under what are practically field conditions. The pupal stage undoubtedly requires nine days, depending somewhat on heat and moisture conditions. Four adult beetles were reared from eggs, and one of the beetles commenced to lay eggs for a second generation in the same year. Over 15 larvae were reared to partial maturity but died before pupation because of deficient food, which suggests that a second generation may occur under suitable conditions.

**Work Connected with Insect and Fungus Pests and their Control.—
Report of the Botanic Station and Experiment Plots, Antigua,
1911-1912, Barbados, 1913, pp. 22-23.**

For the first time on record, a specimen of the sugar-cane root-borer was found in Antigua, by Mr. H. A. Ballou, Entomologist to the Imperial Department of Agriculture for the West Indies. 'Hard-backs' [Lamellicorn beetles] attacked young cane directly, while in Porto Rico they are reported to be root-trimmers. The term brown hard-back, as used in Antigua, probably includes more than one species. The brown hard-back in Barbados is *Phytalus smithi*; that in St. Kitts is *Lachnostenra patruelis*. The difficulty now experienced by planters in establishing sugar-cane on some of the heavy lands of Antigua may possibly be due to the hard-back. Vaporite has been tried as a means of control, but the insect is only found after a depth of over nine inches is reached. Carbon bisulphide would probably kill the grubs, but the cost is too high for practical purposes. Slight damage was done to sugar-cane by caterpillars of *Diatraea saccharalis* which is responsible for what is known locally as 'dead hearts.'

The flower-bud maggot (*Contarinia gossypii*) appeared on cotton in Antigua during the latter end of November and disappeared during March. The early planting of the crop, so that it is beyond the flowering stage when the pest appears, is the only method of combating it. Several severe attacks of *Alabama argillacea* were experienced which were controlled with Paris green. Some weevils [*Lachnopus*], which have not been identified, did a fair amount of damage by nibbling the young growth of cotton, but were kept under control by the application of Paris green and by collecting the weevils in kerosene and water. The leaf-blister mite (*Eriophyes gossypii*) was common during the latter end of the season, but did little damage. Various other pests occurred but did not assume serious proportions.

The lime scale-insects are kept in check during good seasons by the red-headed fungus (*Sphaerostilbe coccophila*), the shield-scale fungus (*Cephalosporium lecanii*), and the black fungus (*Myriangium duriae*). In addition there are probably numerous insects parasitic on scales. The artificial introduction of the black fungus is the subject of investigations, which are being continued. It is generally acknowledged by planters in Antigua that good cultivation and liberal manuring do more for the control of scale-insects, by keeping the lime-trees in good health, than the application of insecticides.

Coconuts have been attacked by *Aspidiottus destructor*, but so far it has not been found necessary to apply any remedy.

The onion crop always suffers from attacks by caterpillars, which are controlled by stomach poisons. A remedy has yet to be found for the Jacob, *Euscepes (Cryptorhynchus) batatae*, of sweet potatoes. Cacao is attacked by Thrips occasionally, but on account of the smallness of the area grown, little notice is taken of it. As in the case of most West Indian islands, Antigua possesses a Plant Protection Ordinance.

WATSON (J. R.). Spraying Tomatoes for Thrips.—*Univ. Florida Agric. Expt. Station, Report for 1912, March 1913*, pp. lxii-lxii.

These experiments were made at Pompano. The wet weather appeared to have interfered with the growth of the plants and the fruit was not setting. The majority of the blossoms looked yellow and when touched dropped off, separating at the node, half an inch below the blossom. When these yellow blossoms were opened they were found to be infested by numerous *Euthrips tritici*. If only one or two were present the damage was generally confined to the anthers, but if there were a half dozen or more insects in a single blossom the pistil and especially the stigma was usually attacked. Eggs were found in the style and in the pedicel. The average number of Thrips found in 15 blossoms was eight and they were not as numerous in the freshly opened blossoms as in the older ones; there seems little room for doubt that the Thrips were responsible for the dropping of the flowers. A trial strip was sprayed with the following mixture:—Commercial lime-sulphur (33° Baumé), $5\frac{1}{2}$ gallons; ‘Black-leaf 40’, 14 fluid ounces; water, 200 gallons. It was estimated that 78 per cent. of the Thrips were killed by this spray.

WATSON (J. R.). Insect Pests of the Year.—*Univ. Florida Agric. Expt. Station, Report for 1912, March 1913*, pp. lxii-lxiii.

A severe outbreak of *Alabama argillacea* occurred all over the Southern States and the adult moths reached as far north as New York, Massachusetts, and even Canada. The cotton over the whole cotton-growing region was almost entirely defoliated. The bean leaf-roller (*Eudamus proteus*) was abundant and destructive, as also was the velvet bean caterpillar (*Anticarsia gemmatalis*). The pumpkin bug (*Nezara hilaris*) was troublesome during the autumn and caused severe damage in some orange groves. *Icerya purchasi* has been found in Tampa and specimens were received from Arcadia, Knights and Haines City. This is the first occurrence of this pest outside of the St. Petersburg sub-peninsula; it appears to be slowly spreading, but has not yet produced any severe outbreak. The boll weevil (*Anthonomus grandis*) reached Florida in the autumn of 1911; specimens were received from Escambia County and it was reported from Santa Rosa County. The fall army-worm (*Laphygma frugiperda*) was reported as being very serious in Gadsden and Walton Counties. The melon and pickle worms (*Diaphania hyalinata* and *D. nitidalis*) did a large amount of damage in Alachua County and in other parts of the State. Corn bill-bugs (*Sphenophorus*) were received from Greenville where they were reported to be doing much damage. Specimens of velvet beans which failed to ripen before frost were found to be infested with larvae, which proved to be those of an Anthribid, *Brachytarsus variegatus*. This is interesting as being the first information on the food of the larvae

of this species, so far as known to the author. Most species of *Brachytarsus* feed on scale-insects, although they sometimes feed on seeds. They have not been observed to attack ripe velvet beans. Specimens of the mango scale (*Pulvinaria psidii*), which was introduced into Florida several years ago, were received from Buena Vista.

BENTLEY (G. M.). *The San José Scale in Tennessee, with Methods for its Control.—Tennessee State Board of Entomology, Knoxville, Bull. no. 8 (ii. no. 1), 24 pp., 21 figs.*

In Tennessee the San José Scale first made its appearance in the eastern part of the State at Harriman, Roane Co., where it was brought in on nursery trees during 1891 or 1892, yet it was not discovered until 1896. The following year it was found in Claiborne Co.; in 1898 in Washington Co. An annual inspection of all the nurseries of the State is made and when scale is found the infested tree is pulled up and burned. In bad cases the nursery is moved, in others spraying is recommended. A further precaution is that all trees, buds, grafts or cuttings of fruit trees to be sold in the State of Tennessee must be fumigated with hydrocyanic acid gas immediately before shipment or delivery. After dealing with the habits and life-history of the San José Scale, its parasites and other enemies, the author discusses spraying and fumigating methods. Amongst other precautions to be taken when spraying with lime-sulphur solution, it is advisable for the operator to smear vaseline upon the face and hands and to use a pair of oil- or tar-soaked cotton gloves and to be careful that there are no leaks in the nozzle or hose. Spraying should only be done when the tree is dormant. The bulletin contains a diagram of a simple steam boiling outfit for preparing lime-sulphur washes. The quicklime and sulphur mixture (7 : 6), contained in four barrels placed on a platform 6 feet above ground, is boiled by forcing steam into these barrels through vertical pipes ending in perforated cross-arms and connected at their upper ends with a horizontal main pipe from the boiler. Each steam-pipe leading into a barrel is provided with a globe valve, and each barrel has a pipe (with valve) for drawing off the mixture after boiling. These latter communicate with a large pipe carrying the liquid to the waggon-tank or spray barrels.

BENTLEY (G. M.). *Eighth Annual Report (i. no. 4) of the State Entomologist and Plant Pathologist for 1912.—Tennessee State Board of Entomology, Knoxville, 1913, 64 pp., 9 figs., 4 maps.*

The estimated loss in Tennessee from insects destroying crops is as follows:—Corn \$5,558,300; wheat \$794,900; barley \$7,600; rye \$22,400; buckwheat \$3,800; oats \$307,100; hay and forage crops \$1,261,800; tobacco \$530,145; nursery stock \$104,200; strawberries \$83,579; orchards \$345,900; grapes \$1,404; forest and timber products \$851,500.

For the first time in Tennessee the strawberry root-louse (*Aphis forbesi*, Weed) has been discovered doing appreciable damage to the strawberry plants. A map shows the infested localities to be in the Lauderdale, Gibson, Weakley, Henry, Davidson, Hamilton, Rhea, Blount and Jefferson Counties. Because of the smallness of this aphid and its resemblance to other plant lice, little notice has been taken of the pest, which has doubtless, in small numbers, occurred in the State for some years. The aphid passes the winter in the egg stage in probably all parts of the State, and as an adult in some localities. The very small shiny black eggs are deposited on the stems and leaf-ribs of the strawberry, and hatch in March or April. The young feed for a time on the leaves and later on seek the more tender leaves at the crown. In about 15 days they are mature and begin to produce from 15 to 20 apterous young, which are distributed by their attendant ants. This second generation produces winged and wingless individuals, which in their turn produce a similar generation. At the approach of cold weather the winter eggs are laid. It is easy to detect the presence of the strawberry root-louse by the condition of the plants, which show lack of vigour, wilt and gradually die, owing to the pest sucking the juices from the roots. It is not safe to replant strawberries on infested land until some other crop has been grown upon it, preferably for two years. As the aphid and its eggs are readily transported, it is important that plants should be obtained from non-infested localities. In case of doubt they should be dipped in strong tobacco solution or diluted 'Black Leaf 40,' or fumigated with hydrocyanic gas.

The report also contains remarks on the quarantine regulations against the Mexican cotton boll weevil (*Anthonomus grandis*), a list of 351 Tennessee nurserymen having State inspection certificates, and a map showing the progress of Texas fever tick eradication work in Tennessee. On 20th December 1912, there were only eight counties or parts of counties which were still quarantined on account of the southern cattle tick. During July and August, 1912, an agricultural special train was sent to various parts of the State and lectures were held on insect friends and enemies, and other subjects of technical interest to farmers.

WATSON (J. R.). The 'Natural Mortality' of the White-Fly.—
Univ. Florida Agric. Expt. Station, Report for 1912, March 1913, pp. xlvi-lxiii.

On a majority of leaves heavily infested with white-fly (*Aleurodes citri*) a few, and sometimes a large number, of the larvae are found to be dead and of a colour varying from dull white to deep brown. These larvae have not been killed either by *Aschersonia*, or by the brown fungus (*Aegerita webberi*), or by the cinnamon fungus, and writers on the subject have been accustomed to speak of these dead larvae as the victims of 'natural mortality.' The object of the author's enquiry was, if possible, to discover the cause. The disease is contagious and in a grove or row of trees in a nursery it obviously spreads from

centres of infection. It may even be abundant on a few leaves of one plant and practically absent from all other leaves on the same plant. On some leaves it may kill 99 per cent. or more of the larvae, though 10 to 30 per cent. is more common. Microscopical examinations revealed the presence of mycelia of fungi, and further study showed that more than 50 per cent. presented these fungus filaments in their interior. A quantity of larvae were taken from infected leaves and divided into two lots; one was treated with one-tenth per cent. solution of mercuric chloride to sterilise the outside, and the other lot was untreated. Cultures were made by various methods and the process continued until pure cultures were obtained which were then transferred to sweet potato and used for spraying experiments. *Microcera* appeared in nearly 98 per cent. of the colonies, and of these 28 per cent. were pure cultures of *Microcera*. In view of the known pathogenic nature of this fungus these figures in the author's opinion leave little doubt as to the cause of the disease known as 'natural mortality.' It would seem that in a majority of cases this fungus does not develop sufficiently on the white-fly larvae to produce the characteristic white fringe which has given it its name of 'white fringe fungus.' Further observations showed that the adults of *Aleurodes citri* are also attacked by the fungus, and numbers of eggs were observed which were shrivelled and apparently parasitised by it. Having obtained a sufficiency of material the nursery stock in the horticultural grounds of the Station was sprayed. As the plants were already largely infected and it was almost impossible to find plants with uninfected larvae, an estimate had to be made of the extent of infection already existing and of the increase produced by spraying with the fungus culture. The results were not very conclusive, but on the whole tended to show a rise in the mortality of the larvae. It would appear that particular weather conditions are necessary for the rapid spread of the *Microcera*, viz., damp and coolness and also a more or less crowded condition of the larvae on a leaf. This fungus does not seem to be so destructive to larvae as the brown fungus (*Aegerita*). On the other hand it is more generally present on white-fly in the nurseries. The author comes to the conclusion that it would be an excellent plan to include cultures of *Microcera* or of infected larvae when spraying with the other fungi.

WATSON (J. R.). The Spread and Parasitization of *Aleurodes howardii*.—*Univ. Florida Agric. Expt. Station, Report for 1912, March 1913*, pp. liv-lx.

This insect, known as the Woolly White-fly, was introduced into Tampa probably from Cuba three or four years ago and has caused some apprehension because of the evil reputation of its very close relative *Aleurodes citri*. Investigation made at Tampa and in the St. Petersburg region showed a general distribution of this fly in all the citrus groves, though in the latter place larger groves outside the city were not affected. Compared with *A. citri*

infestation is by no means severe, although the insect is much more apparent on account of its woolly secretion. The fungi which attack *A. citri* were never found on *A. howardii*, but Back states that the red *Aschersonia* occurs on this species in Cuba. The author thinks that the time of year at which the visit was made renders the evidence on this point a little inconclusive, and that possibly the fungi attack *A. howardii* as much as *A. citri*. *A. howardii* is very seriously parasitised by a hymenopteron, probably a Chalcid, 50 to 98 per cent. of the individuals in different colonies showing the oval exit hole of the parasite. A large amount of information is given as to individual local outbreaks of the fly and results of spraying with fungi. Attempts were made to import parasitised specimens of the Coconut White-fly (*A. cocois*) from St. Vincent but the experiments were unsuccessful. Most of the material arrived dead and those that reached Florida alive and were released do not appear to have produced parasites capable of attacking *A. citri*.

RORER (J. B.). The Green Muscardine Fungus and its Use in Cane Fields.—*Bd. Agric. Trinidad and Tobago*, 31st March 1913, 14 pp., 2 pls., 2 figs.

The disease of insects caused by the fungus, *Metarrhizium anisopliae*, and commonly called the green muscardine was first discovered in Russia in 1878 among the larvae of certain beetle pests of wheat. Since that time it has been found in nearly all parts of the world attacking a great variety of insects belonging to widely different families. In 1890 it was reported in Trinidad by Hart as one of the natural enemies of the froghopper, and in 1906 Urich again stated that it was common in the Island. It was first tested on froghoppers in Trinidad by Collens in 1908, and the author found it in the latter part of 1909 on dead froghoppers on the Caroni Estate and has cultivated the fungus on a large scale. He has tested it experimentally in a number of cane plantations, and in August last an actual count showed, after six weeks, an average of 92 dead insects per cane-stool. He describes at length practical methods of cultivating the fungus on a large scale, boiled rice having been found to be the most suitable medium for this purpose. Many methods of using the fungus in the field have been tried and two proved successful in certain epidemics of the disease in the latter part of 1912. In the first plan a number of boys carrying tubes containing spores walk through the cane-field and wherever they see a froghopper resting on a leaf they catch it in the tube and let it jump out again. Ten or twelve boys can cover a fairly large area in a day. By this means the fungus was well established in fields at Forres Park Estate. Spreading the spores with a dusting machine is the method which has been most successful in the treatment of larger areas. The spore and starch mixture should be applied at the rate of about three pounds per acre, and the best use for the residual rice is to scatter it about the ground near the cane-stools.

Proceedings of the Forty-Second California State Fruit Growers' Convention, held at Fresno, Cal., 11th-13th Dec., 1912.—*Monthly Bull. State Comm. Hortic., Sacramento, Cal.*, ii, nos. 3 and 4, March and April 1913, pp. 353-530.

Several papers of interest to the economic entomologist were read and discussed at the convention. In an address on the control of the red spider, Mr. W. H. Volk mentioned that in California there are three species which are frequently responsible for considerable damage to crops, viz., the citrus red spider (*Tetranychus mytilaspidis*), the yellow mite (*T. bimaculatus*) and the almond red spider (*Bryobia* sp.). A discussion followed on the relative merits of sprays, sulphur dusting being effective only within a short time after it is applied, whereas a sulphur- or lime-sulphur-flour-paste spray is more effective and remains longer on the tree. The grape-leaf hopper or 'vine-thrips,' according to H. J. Quayle, is a pest second only to *Phylloxera* as regards damage done, in the San Joaquin and Sacramento valleys. It also occurs in the coast valleys, but is seldom injurious there, and also in Southern California, but south of the Tehachapi it is most serious as a pest in the Imperial Valley. Spraying for the nymphs in May or the beginning of June would pay well if the hoppers are present in excessive numbers, or capturing by some mechanical means such as by suction, preferably in the early spring, when the shoots of the vine are six to eight inches long. In the course of a paper on 'Details in Citrus Culture' Mr. C. C. Chapman strongly recommended fumigation against the black, red and purple scales, which are numerous and troublesome in every citrus district in California, though less so in the interior than at the coast.

The Californian horticultural quarantine service has active working commissioners in 42 out of a total of 58 counties in the State. The most stringent regulations are in force at the five ports of entry, San Francisco, San Diego, Los Angeles, Santa Barbara and Eureka, no fewer than 45,090 parcels having been fumigated and 3,937 parcels destroyed or returned during the fiscal year 1911-1912, and a total of 847 ships inspected. The tropical fruits carried in the ships' stores are generally infested with maggots, the worst offender being the mango. In the opinion of the chief deputy quarantine officer it would be a good investment for Californian growers to destroy all the mango trees in Hawaii. The immediate source of danger is the possibility of passengers carrying infested material to some country district, and police regulations seem necessary. The steamship companies are very actively co-operating in the matter, and leaflets in several languages are distributed amongst the passengers warning them not to carry tropical fruits with them when leaving the ship.

CHOLES (H. J.). Diseases of the Sugar-cane.—*Agric. Jl. of the Union of South Africa*, v, no. 5, May 1913, p. 753.

The sugar-cane plantations of Natal are strikingly free from original troubles of any sort. Destructive insects are conspicuous

by their absence, and in view of the consistent efforts which have been made to prevent the introduction of pests from abroad, there is every hope that this happy state of affairs will long continue. During the period of locust invasion the cane-fields suffered constant damage, but this form of insect attack is now a matter of the past. Among the minor troubles, Mr. Fuller, Government Entomologist, records the mealy bug, the cane caterpillar, and the fungus disease known as cane spume. There has been an isolated outbreak of white grub which appears to have been quite sporadic. Cane spume and the cane mealy bug are seemingly quite innocuous to the Uba variety, now almost exclusively grown in Natal.

Cacao Thrips and Cacao Beetles in Trinidad.—*Minutes of the Meeting of the Board of Agriculture*, no. 4, 6th May 1913, p. 26.

Mr. F. W. Urich, Entomologist to the Board, reported that he visited Sangre Grande, Carapichaima, Tamana, Chatham and Chaguanas districts and there were hardly any Thrips to be seen. The Cacao Beetle (*Stirastoma*) on the contrary is very prevalent in some districts. Experiments in cutting out larvae and applying arsenate of lead to the trees have been started, but it is too early as yet to record any results. Beetles were more numerous from January to March and are likely to appear again in September and October.

VUILLET (A.). Les "Chenilles Communes." [The Brown-tail Caterpillar.] — *Rev. Phytopathologie Appliquée*, Paris, i, no. 2, 20th June 1913, pp. 17-19, 4 figs.

The larvae of *Euproctis chrysorrhæa*, commonly known as "cul-brun" or "cul-doré" are to be found over the greater part of France from the end of January to the beginning of August. The eggs are laid during July, almost always on the lower surface of the leaf, and the larvae weave a sort of common nest in the autumn to protect themselves against the cold and rain of winter. But in the south of France, the same caterpillar, which there lives principally on *Arbutus*, makes its nest with much less care and comes out of it to feed even in winter. In the more northern parts of the country a thick web appears to be sufficient to protect the larvae from even severe winters.

The author says that there are 17 known dipterous and hymenopterous parasites of this caterpillar in Europe. Some, like *Telenomus phalenarum* and a species of *Trichogramma*, develop in the eggs of *Euproctis*. Others, *Apanteles viminetorum*, *Meteorus versicolor* and *Zygobothria nidicola*, attack the young caterpillars in the autumn, while *Pteromalus egregius* and *Monodontomerus aereus* attack them in the winter. Others again, such as *Compsilura concinnata* and *Tachina larvarum* parasitise the older caterpillars in spring, whilst *Pimpla instigator* and *P. examinator* attack the chrysalis. Predatory insects, such as *Calosoma sycophanta* and *C. inquisitor*, prey upon the insect at

all stages. The moths are specially devoured by bats and toads, and the author says that it is possible to see the toads waiting around a light which attracts the moths. In his opinion there is no reason why the attack of this moth should be greatly feared, provided that the fight against it be properly organised and the collection of the tents be thoroughly and systematically carried out, because it can be done at a time of year when there is an abundance of labour, that is to say in the winter, and he thinks it is not necessary to consider any other remedy.

PÉNEAU (J.). *Les Pucerons des Rosiers.* [The Rose Aphid.]—*Revue de Phytopathologie Appliquée, Paris*, i, no. 2, 20th June 1913, pp. 20-22, 13 figs.

The author, after describing the general biology of the Rose Aphid and the destruction done by it, says that, except in the case of climbing roses, it is not difficult to destroy, and that a 2 per cent. solution of soft soap used as a spray at intervals of eight days will usually be sufficient to clean a rose tree. In serious cases a third spraying may be necessary. He draws attention to the fact that however careful one gardener may be, if his neighbour neglects to clean his trees he will provide sufficient females to undo all the results, and that in consequence it may be necessary to spray almost continually. The destruction of the eggs in winter is important and this may be done by painting the stems with lime in the month of June, or better still with a mixture of quick lime 5 parts, sulphate of iron 3 parts, water 50 parts, all by weight. Another mixture, which he says is even better, is known as Mélange de Balbiani and is made by dissolving 7 lb. of naphthaline in 5 lb. of coal tar, adding 24 lb. of slaked lime and making up to 10 gallons by the gradual addition of water.

SCÈLSI (S.). *Contro la mosca dell'olivo.* [Remedies against the Olive Fly.]—*Rivista di Agricoltura, Parma*, xix, no. 24, 13th June 1913, pp. 280-281.

The author reminds olive-growers that the time is at hand when all necessary precautions against the olive fly must be taken and that the trees should be sprayed from the early days of July up to the end of October, at intervals of about a month, with either of the following arsenical solutions. (a) *Berlese formula*: molasses 20 lb., arsenate of potash 4 lb., water 20 gallons; (b) *De Cillis formula*: molasses 130 lb., honey 62 lb., glycerine 4 lb., arsenate of soda 4 lb., water 20 gallons. The spraying with either solution should be done thoroughly, so that the leaves are properly wetted with the mixture. Great stress is laid upon the necessity for combination amongst neighbouring olive-growers in order that the best results may be obtained, as otherwise more than 50 per cent. of the produce on the borders of a well-sprayed olive-grove may be lost owing to reinfection from outside.

BENTLEY (G. M.). *Suggestions on Preparation and Use of Spray Formulas.*—*Tennessee State Board of Entomology, Knoxville, Bull. no. 10 (ii. no. 3), September [sic] 1913, 24 pp., 8 figs.*

The author points out that while much may be accomplished in the control of insects by the use of insecticides, more attention should be paid to the prevention of the introduction of crop pests by judicious legislation, to the selection of resistant plants, to the elimination of worthless plants which harbour pests or act as intermediary hosts and are often of the same family as those under cultivation, to judicious rotation of crops, and to better drainage, cultivation and fertilisation. A list of 32 insecticides, fungicides and herbicides is followed by suggestions for the treatment of different crops, arranged alphabetically, when infested by various pests.

BALLARD (E.). *Some Cotton and Tobacco Pests of Nyasaland.*—*Supplement to the Nyasaland Govt. Gazette, 30th April 1913, Zomba, 9 pp.*

The author gives an account of the life-history and bionomics of *Diparopsis castanea* (red boll-worm), *Earias insulana* (Egyptian boll-worm) and *Chloridea obsoleta* (American boll-worm). The first two can be kept in check by collecting all attacked bolls and by thorough ploughing at the end of the season. The red boll-worm appears at the end of January or the beginning of February. The Egyptian boll-worm is not very plentiful, though generally distributed; in Zomba it was first found feeding on the seeds of Hibiscus in the Botanical Gardens. Against American boll-worm the sowing of Chimanga amongst the cotton at the rate of 1 row in 5 at such a time that it will be in tassel before the cotton is in bud, is found to be effective. Leaf-eating caterpillars invade the cotton fields in large numbers from one season to another. In the present year, 1913, they are reported as a serious pest and it is said that very frequently the species is most prevalent one year is absent the next, or only present in small numbers. Last year the larva of *Plusia chalcytes* was very common, but it was attacked by a fungus disease and practically annihilated. Many of these caterpillars are also parasitised by Ichneumons and Tachinid flies, one a species of *Masicera*. The larva of a butterfly, *Hypolimnas misippus*, was also common for a time. The author says that spraying with lead arsenate or Paris green is very effective against caterpillars and might be possible on a small estate, but in a country in which all spraying has to be done by knapsack spraying machines, the cost in labour and machines of spraying a large acreage would be too great.

Apion armipes (cotton stem weevil) damages the plants by tunnelling into the stem, and when fully grown pupates there. The stem of the plant is so weakened that it is easily broken by the wind. The best remedy is said to be the burning of all infected plants.

Prodenia litura has proved a very serious pest of tobacco plants in the nurseries. It is kept in check to a certain extent

by an Ichneumon. There are two remedies which the author says are possible; hand-picking, which is unsatisfactory, because the larva has a habit of hiding in the ground during the day; and spraying, which is better, because in addition many other pests are killed. He recommends lead arsenate 1 lb. to 60 gals. of water, mixed with molasses or coarse sugar, to be sprayed over the plants once every 10 days as a fine mist and evenly distributed over the leaves. The plants should not drip after the application. The tobacco stem borer [the moth has since been determined by Mr. J. H. Durrant as *Phthorimaea heliopa*, Lower] causes much loss every year in the tobacco nurseries, as every plant attacked is thereby rendered useless for planting out. All infected plants should be pulled up and buried or burnt. The natives of the Protectorate, as also in India, slit the side of the infected stem and remove the caterpillar. This is supposed to enable the plant to grow, but probably the contrary is the case. The worst enemy of tobacco which has been planted out is the greasy cut-worm (*Agrotis ypsilon*). The author recommends the poison bait method as used in America and also the employment of children to search for the worms in ground where they are hiding. Large numbers, the author says, may be destroyed in this way, but he urges that whatever method is used it must be thorough; half measures are of no use whatever.

HOLMAN-HUNT (C. B.). Notes on Insect Pests.—*Agric. Bull., Fed. Malay States*, i, no. 10, May 1913, pp. 368-369.

The principal insect pest in the Federated Malay States has been the locust, which has been swarming in many districts in Selangor and Negri Sembilan. The damage has been trivial so far, as the locusts do not attack rubber, but they feed on coconuts and rice, and it would be advisable to keep them in check, so as to avoid an expensive campaign in the future. Parasitic fungus cultures have been tried with little success, but a fair number of Malays, Tamils and Chinese have availed themselves of the liberal government reward of 50 cents. per kerosene oil tin full of locusts. The locusts seem to have few natural enemies in the F. M. S.

Drieschweinberge. [Abandoned Vineyards.]—*Der Weinbau der Rheinpfalz, Neustadt a. Hdt.*, i, no. 11, 1st June 1913. pp. 130-131.

The word Driesch or Dreesch, originally applied in low German to uncultivated pasture land, has, in the Pfalz and other German wine-growing districts, assumed the meaning of a vineyard abandoned for some reason or other or not cultivated for two successive years. Apart from their unsatisfactory appearance these uncultivated vineyards are a constant source of danger to the grower, as they form an ideal breeding place for insect and fungus pests.

Viticulture in the Pfalz was threatened to such an extent by vine-moths and *Phylloxera* that the Bavarian Government, by a decree of 24th April, 1913, compels the owners or occupiers, under a maximum penalty of 1,000 Marks or imprisonment up to one year, to uproot and burn all vinestocks in the 'Driesch' and to plough or dig up the ground thoroughly before the 20th of April of each year. Seedlings growing on the borders of the 'Driesch' must be destroyed before 1st July.

LAMBILLION (L.-J.). *La Mésange et les chenilles d'Arctia caja.* [The Tit and the caterpillars of *Arctia caja*.]—*Rev. Mensuelle de la Soc. Entom. Namuroise*, xiii, no. 6, June 1913, pp. 68-69.

In the spring of 1912 a number of caterpillars of *Arctia caja* living in the vineyard of M. Lardinois on purslane were all eaten, with the exception of bits of their integument, by a couple of tits which had entered the vineyard when the door had accidentally been left open. The destruction of large hairy caterpillars by tits is of interest as the cuckoo was supposed to be the only bird that would eat them.

The author also notes the first appearance on 29th May of *Sesia tipuliformis* on *Leucanthemum vulgare* growing near some gooseberry bushes. Hatching took place on 3rd June. On 7th June the gooseberry *Sesia* was observed on *Sambucus nigra* and on a young oak.

CADORET (M. A.). *Nouveau procédé de destruction du puceron lanigère.* [New method of destroying Woolly Aphis.]—*Rev. Phytopathologie appliquée*, Paris, i. pt. 2, 20th June 1913, pp. 27-28.

This method consists in painting attacked parts of the fruit trees with a mixture of linseed oil, 7 lbs.; white lead, 1½ lbs.; white zinc, 1 lb. These are boiled together for ten minutes and when cold 1 lb. of turpentine is added. The mixture is instructed to be laid on with a brush once in the spring and once in the autumn, though one painting is generally sufficient.

GOOT (P. VAN DER). *Zur Systematik der Aphiden.* [On the classification of Aphides.]—*Tijds. Entomologie*, s'Gravenhage, lvi, nos. 1 and 2, 30th June 1913, pp. 69-154, 20 figs.

In this paper the author undertakes a thorough revision of the Aphides, based on morphological characters hitherto neglected for systematic purposes. Tables for identifying many of the genera and species are given. Of the 12 tribes referred to the sub-family *Aphidinae* only seven are here tabulated, comprising 40 genera, of which 12 are described for the first time.

CAMERON (P.). On the Parasitic Hymenoptera reared at Dehra Dun, Northern India, from the Lac (*Tachardia*) and Sal Insects.—*Indian Forest Records*, iv, pt. ii, Jan. 1913, pp. 1-20.

There can be no doubt that the Chalcids of the subfamilies APHELINAE and ENCYRTINAE are direct parasites of the lac and sal insects, but as regards some of the other CHALCIDIDAE and the BRACONIDAE enumerated in this paper, it is probable that they prey on moth larvae which feed on the Coccids. That a Tineid larva does feed on lac insects is certain from the observations of Mr. E. E. Green in Ceylon. If it be the case that they destroy Tineid larvae which kill the lac insects, the BRACONIDAE must be looked upon as beneficial insects, while the ENCYRTINAE and APHELINAE are injurious, as they kill useful insects.

As bearing on the parasites of the lac insect, it may be useful to note that Mr. E. E. Green reared from *Tachardia albizziae* in Ceylon, *Encyrtus tachardiae*, How., *Anastatus tachardiae*, How., *Holcopelte* sp., *Tetrastichus* sp. (probably a hyperparasite), *Bracon greeni*, How., and *Aphrastobracon flavipennis*, How., the last two being probably parasitic on moth larvae.

SURFACE (H. A.). Pests of Domestic Animals, Households and Buildings, Bush Fruits and Lawn Plants.—*Bi-Monthly Zool. Bull. Div. Zool. Pennsylvania Dept. Agric*, iii, no. 1, Jan. 1913, pp. 30, 8 figs.

This bulletin is the third of a series dealing with the suppression of insect pests in Pennsylvania.

Of the two Bee Moths, *Galleria melonella*, L., and *Achroia grisella*, F., the former is much the commoner. The larvae tunnel through the combs, destroy the wax and kill the bee larvae or uncap the cells. The suggested remedies are to keep the hives clean and inclined slightly toward the front. Split reeds, placed in the hives with the hollow side downward, serve as a trap for these pests and should be removed twice a week to kill the insects that have collected in them. A strong colony of Italian bees or requeening with an Italian queen is perhaps the best remedy. The Bee Louse (*Braula caeca*, Nitzsch) is common in Europe and is sometimes imported with bees into the U.S.A., though it is not common there. It is easily seen and can be removed with a brush, or, when the worker is found with the fly upon it, both bee and parasite should be killed and removed from the hive. Queens from Europe should be carefully examined when received. Amongst other enemies of bees the Kingbird or Bee Martin (*Tyrannus tyrannus*, L.) is popularly supposed to be a great enemy of bees, but it is really more a destroyer of those insects which kill honey bees, such as the Robber-fly, than it is of the bees themselves. Analyses of the stomach contents show that the Kingbird feeds mostly upon drones, and is not a serious enemy of the worker.

The author then deals briefly with pests of stored grain and hay, such as the Angoumois Grain Moth (*Sitotroga cerealella*, Oliv.), the Clover-Hay Worm (*Hypsopygia costalis*, F.), etc.

The following are given as pests of bush fruit: the Currant Borer (*Sesia tipuliformis*, L.), Currant Worm (*Pteronus ribesi*, Scop.), Currant Aphid (*Myzus ribis*, L.), Leaf Hoppers (*Jassidae*), Four-lined Leaf-Bug (*Poecilocapsus lineatus*, F.), San José Scale (*Aspidiotus perniciosus*, Comst.), Scurfy Scale (*Chionaspis furfuris*, Fitch) and the Gooseberry Fruit-Worm (*Zophodia grossulariae*, Pack.).

The common pests of animals are briefly mentioned, with short notes as to remedies, and the author then goes on to discuss the universally distributed pests of the household.

MELANDER (A. L.) & KENT BEATTIE (R.). *The Penetration System of Orchard Spraying.*—*State College of Washington Agric. Expt. Station, Pullman, Washington, Bull. no. 106, Jan. 1913, 40 pp., 15 figs.*

In this bulletin the system of high pressure spraying of orchards is described and details of the apparatus to be used are given, with figures of crooks and nozzles, and a schedule of items for intending purchasers of power sprayers indicating the points to be studied in the spraying outfit, according to the conditions under which it is to be used. The author says that the penetration system is acknowledged to be the most successful by all commercial orchard owners in the North-Western States. The mist spray nozzle and pressure below 100 pounds were formerly in use, and crooks for directing the spray, so as to prevent waste and secure efficient spraying, were hardly known; now high pressure (250 pounds) is in common use. A case is given of a grower who in 1906, in spite of four applications of strong spray with a power pump, lost 4,000 boxes of apples from Codling Moth. In 1907 the orchard was sprayed on the high pressure system and the total loss for that year amounted to only six boxes. In another case an orchard sprayed on the Vermorel system lost 60 per cent. of its crop, and in the following year, when high pressure was used the loss was reduced to 1 per cent. The returns from a large number of apple-growers are said to show that whereas with seven summer applications per annum with the Vermorel nozzle, they used to secure about 80 per cent. of sound fruit, now with the Bordeaux nozzle and less than half the former number of applications, their returns average over 95 per cent.

The bulletin concludes with a list of 31 publications by the authors on the subject of apple orchard spraying.

HARTZELL (F. Z.). *The Grape Leaf-Hopper.*—*N.Y. Agric. Expt. Sta., Geneva, N.Y., Tech. Bull. no. 359, Feb. 1913, pp. 51, 3 figs., 6 pls.*

This insect was very abundant during the latter part of the summer of 1911 and it is estimated that in Chautauqua County alone at least one quarter of the vineyards, representing 10,000 acres, showed serious attack on the foliage by this pest. Conditions in other districts were similar. The hard winter of

1911-12 gave reason for hoping that the bulk of the hibernating adults would be killed, but this proved not to be the case, and the growers in consequence sprayed the vineyards more frequently than usual. Nevertheless damage was less than was expected, because the weather from June to September was much cooler than usual and also the rainfall was above the average. The net result was that the number of hoppers going into winter quarters in the autumn of 1912 was less than in the previous year, but the author is nevertheless of opinion that considerable damage may be expected in 1913.

The adults remain on the vines until nearly all the leaves are shed. In autumn they are to be found among fallen leaves, cover crops, weeds and grasses in the vineyards. Hibernation generally begins towards the end of November or the beginning of December. The largest number survive the winter on high, dry lands where there is no winter flooding and the rains soon drain away. It would appear that the adults are able to withstand considerable cold (14° F. and 18° F.) without any special mortality.

The spring food-plants are raspberry, blackberry, strawberry, burdock, catnip, Virginia creeper, currant and gooseberry, the preference being in the order given. When these plants are wanting they feed on others, for example, beech and sugar-maple. The insects migrate from their spring food-plants to the grape vines, feeding on the lower leaves until about the middle of July and gradually invading the upper portions. This is possibly due to the fact that the insect seems unable to resist wind, as during storms they leave the vines and descend into the grass or weeds, returning when the wind abates.

The results of spraying on several vineyards are given, the sprays used being somewhat varied; chiefly "Black leaf 40" combined with either arsenate of lead or Bordeaux mixture. The spraying was done about the middle of July in all cases. Experiments showed that nicotine at the rate of .02 per cent. either in water or Bordeaux mixture is an effective insecticide against the nymphs of the grape leaf-hopper.

The general effect of the insects observed is to cause a decrease of woody growth and a depreciation in the quality of the fruit. Concord grapes, which normally have a bluish-black colour when ripe, have a reddish appearance when the vines are attacked by the leaf-hopper. There is also a decided lack of flavour and a decrease of sugar. A table showing the results of analyses of grape-juice is given.

WOGLUM (R. S.). Report of a Trip to India and the Orient in Search of the Natural Enemies of the Citrus Whitefly.—U.S. Agric. Bureau of Entomology, Bull. no. 120, 28th Feb. 1913, 58 pp., 12 pl., 2 figs.

In 1910 the author was requested by the U.S. Bureau of Entomology to search for the home of the Citrus Whitefly and to ascertain if it was anywhere attacked by natural enemies other than those already known in Florida. No *Aleurodes citri* were

found in Spain, Italy, Sicily or Ceylon, nor was the species represented in Mr. E. E. Green's extensive collection of Singhalese ALEURODIDAE. An examination of the ALEURODIDAE in the Calcutta Museum revealed specimens of *Aleurodes aurantii*, Maskell, from oranges from the N.W. Himalayas, which were identical with the Floridan species *Aleurodes citri*, R. and H., moreover orange leaves from Kulu were found to be infested by the same species. At Saharanpur slightly infested orange trees were discovered, also about 200 specimens of the Coccinellid *Cryptognatha flavesrens*, which were feeding on the pupae of the Whitefly. Two consignments of these Coccinellids were sent to Florida, but they died in transit. A brown fungus, *Aegerita webberi*, parasitising *Aleurodes citri* at Saharanpur, had been introduced into Florida on citrus trees several years ago; but the most important discovery was that of an internal parasite, *Prospaltella lahorensis*, at Saharanpur and Lahore. The author examined orange trees at Peshawar, at Dehra-Dun, in Sikkim, in Assam, at Poona and Nagpur, and concludes that *A. citri* is distributed throughout India. Evidence of parasitism was seen in practically all the infested localities. In Moulmein, Lower Burma, the orange trees examined were free from the pest, nor was it observed in Java during a three weeks' sojourn. Some infested orange trees were seen in Macao, but in the Philippines the pest was absent. Returning to India in April 1911, the author obtained sufficient material of *A. citri* and its parasite, *Prospaltella lahorensis*, for transportation to Florida. Many difficulties were encountered, for instance, a number of young orange trees from one to four feet high, on which *A. citri* was intended to feed, were spoilt by a leaf-miner (*Phylloconistis citrella*) and a bud-worm (*Agonopteryx* sp.). New orange trees were successfully infested by *A. citri* under a canvas awning which kept out these undesirable pests, and five 'Wardian cases' of natural enemies of the Whitefly were dispatched from Lahore on 20th October 1911. They arrived at Orlando, Florida, on 2nd December, and an examination at the government laboratory showed that 28 healthy *Cryptognatha flavesrens* and eight adults and several pupae of *Prospaltella lahorensis* had survived the journey. Unfortunately the Whiteflies were in a dormant pupal state in Florida at that time of the year, and the parasites as well as the Coccinellids, in spite of all efforts to rear them under laboratory conditions, were dead by January 1912.

The following is a list of insect pests of citrus trees seen by the author:—

Spain.

- Chrysomphalus dictyospermi*,
Morg.
- Parlatoria zizyphus*, Lucas.
- Pseudococcus citri*, Risso.
- Lepidosaphes beckii*, Newm.
- Lepidosaphes gloveri*, Packard.
- Aspidiotus hederae*, Vall.
- Saissetia oleae*, Bern.
- Coccus hesperidum*, L.

Italy and Sicily.

- Chrysomphalus dictyospermi*,
Morg.
- Parlatoria zizyphus*, Lucas.
- Lepidosaphes beckii*, Newm.
- Pseudococcus citri*, Risso.
- Aspidiotus hederae*, Vall.
- Saissetia oleae*, Bern.
- Coccus hesperidum*, L.

India.

<i>Chrysomphalus aurantii</i> , Mask.	<i>Fiorinia theae</i> , Green.
<i>Chrysomphalus aonidum</i> , L.	<i>Vinsonia stellifera</i> , Westw.
<i>Erium</i> sp.	<i>Aleurodes citri</i> , R. and H.
<i>Monophlebus dalbergiae</i> , Green.	<i>Aleurodes</i> , 3 spp. (undetermined).
<i>Pseudococcus citri</i> , Risso.	
<i>Aspidiotus lataniae</i> , Sign.	<i>Papilio demoleus</i> , L.
<i>Lepidosaphes beckii</i> . Newm.	<i>Phylloconistis citrella</i> , Stainton.
<i>Lepidosaphes lasianthi</i> , Green.	<i>Agonopteryx</i> sp.
<i>Coccus hesperidum</i> , L.	

FULLER (C.). The Sombre Twig Pruner, *Thercladodes krassi*, White.—*Agrie. Jl. U. S. Africa*, v, no. 2, Feb. 1913, pp. 263-288, 3 figs., 10 pls.

This species was described by White in 1855 from Port Natal and is aboriginal. It is widely spread throughout South Africa and sooner or later may become a pest wherever its food-plants are extensively grown.

The author's observations relate chiefly to its attack upon privet and were made in consequence of the extraordinary destruction of privet hedges by the pest during 1910. He is of opinion that if the cultivation of olives assumed importance anywhere in the Union of South Africa this would become a serious pest. The attack on privet usually begins in a small way, becoming intensified from year to year because the broods of beetles display but little tendency to migrate and have a great inclination for laying their eggs on the plant on which they themselves have been bred. According to the author this pest is very easily controlled; its work is always conspicuous and the borers can be so readily traced that any plant or plants may be freed from them at once by the removal of the invaded stems.

The adults leave their tunnels about November and egg-laying commences soon after; as emergence goes on until the end of January the laying of eggs is spread over no less than four months in the year and the broods thus become mixed. The eggs are laid singly in a cavity beneath the bark which is excavated with extreme nicety and the making of it may occupy as much as an hour. The eggs hatch in about twelve days and the borer starts tunnelling in the centre of the stem and from time to time pruning off portions of the already perforated part. The boring is continued always toward the root and no upward or lateral deviation is ever made apart from the initial burrow. The grub stage of the main brood is completed during August and September, when pupation takes place, the adults emerging from these pupae during September and October. The beetles are on the wing from the beginning of November to the end of February and after this they die off. The grubs are to all intents and purposes present all the year round, and before the large grubs from the previous season's eggs have finished feeding, young ones are already at work.

In many cases observed by the author the insect after ovipositing proceeded up the twig a couple of inches and there girdled

it so that it broke off. This was at first thought to be a regular practice but extensive observations have shown that only about one tip in three was so treated. The method of tunnelling by the larva is carefully described and illustrated.

A minute hymenopterous parasite of the egg was found, but no parasites or enemies of the grub or pupa have thus far been noticed.

HASEMAN (L.). Some Orchard Insects of Missouri.—*Missouri State Board of Horticulture, Bull. no. 51 (N.D.)*, pp. 1-31, 4 figs., 7 pls.

In this bulletin the author has given a more or less complete list of the insects injurious to fruit, with a description of each and an account of the life-history, food-plants, nature of the injury done and the remedies. Under insects injurious to the apple he gives Woolly Aphis (*Schizoneura lanigera*, Haussm.) and the Round-headed Borer (*Saperda candida*) which deposits its eggs in the bark during June and July, the grub completing its development in the spring of the 3rd year. The injury is chiefly to young trees and the damage is very largely increased by fungi growing in the burrows. Cutting out appears to be the only remedy, but washes for the trunk are useful as preventives. The Flat-headed Borer (*Chrysobothris femorata*, F.) is not confined to apple, but attacks oak, beech, ash, pear, peach, plum, hickory, chesnut, maple, linden, sycamore, willow and box elder. Trees that have been planted out not more than a year or two will often be completely girdled by 2 or 3 of these grubs and destroyed; the remedies suggested are the same as for *Saperda*. The Shot-hole Borer (*Scolytus rugulosus*, Ratz.) is liable to be overlooked until considerable damage has been done, and multiplies so rapidly that a tree attacked in the spring is often completely destroyed by autumn. The beetle prefers trees which are sickly. All dead or dying trees should be cut down and all dead branches destroyed.

San José Scale (*Aspidiotus perniciosus*, Comst.) is dealt with at some length, as also the Scurfy Scale (*Chionaspis furfuris*, Fitch) and the Oyster-shell Scale (*Lepidosaphes ulmi*, L.). Apple Plant Lice (*Aphis mali*, *sorbi*, *pomi*) can be easily controlled by the use of tobacco contact washes. The injury done to apples by the Buffalo Tree Hopper (*Ceresa bubalus*, F.) is considerable, the trees being totally destroyed in some cases. In the summer the nymphs migrate to weeds and other plants, and the only successful remedy is to clear away this food supply; if the pests are very troublesome, severe pruning is of some value. The Apple Leaf-Hopper (*Empoasca mali*, LeB.) principally attacks young trees up to 4 years of age. It breeds with great rapidity, and the curling of the leaves produced is apt to render spraying ineffective; while the adult insects seem to be extremely resistant. Kerosene emulsions are very useful, as also is the trailing of sticky shields between the rows.

The Evergreen Bagworm (*Thyridopteryx ephemeraeformis*, Haw.), in some parts of the State, is the most destructive pest

of apples that has to be dealt with, especially in south-western and central Missouri. In the cities the larvae are equally injurious to ornamental and shade trees. The usual Codling Moth washes are useful if applied within a week after the blossoms fall. The damage done to apple trees by Fall Cankerworm (*Alsophila pomonaria*, Harris) is often very serious and sometimes the foliage is entirely stripped. They are also not confined to apple trees. It is necessary to spray early, when the caterpillars are small, as when well grown they are very resistant to poisoned sprays: 3 lb. of arsenate of lead to 50 gals. of water is usually quite effective, if applied in time. Bands of fluffy cotton or tanglefoot will prevent the wingless females from climbing up the trees to lay their eggs. One spraying should be given before the blossoms are out, and a second about a week after they fall. The same methods are recommended for Spring Cankerworm (*Paleacrita vernata*, Peck.). The Rascally Leaf Crumpler (*Phycis indiginella*, Z.) is an exceedingly troublesome pest, feeding on the foliage of young apple trees and upon the bark of young twigs. It has also been known to attack plums, pears and cherries. It is a native of the State and is found in great numbers upon the red haw and wild crab, which should therefore be destroyed in the neighbourhood of orchards. The pest is easily controlled in the early spring by the usual spraying for Codling Moth. The Apple Tent Caterpillar (*Malacosoma americana*, Harris) is also readily controlled either by poison or by applying a torch to the tents when they are quite small. The White-marked Tussock Moth (*Hemerocampa leucostigma*, Sm. and Abb.) is the most troublesome species of the genus. The greatest amount of harm is done in nurseries and very young orchards, but shade trees in cities are often seriously attacked. The pest can be controlled either by poison or by banding the trees, as the female moth is wingless. The Fall Webworm (*Hyphantria cunea*, Drury) is usually more abundant on mulberry and box elder than on fruit trees, but in some districts it does great damage in orchards. Burning out the webs in summer or early autumn is the simplest remedy; a little poison sprayed on the foliage immediately around the web is effective. For the Yellow-necked Apple Caterpillar (*Datana ministra*, Drury) and the Red-humped Apple-Worm (*Schizura concinna*, Sm. and Abb.) jarring the trees and trampling the fallen caterpillars on the ground is a simple method of control; or a little poison sprayed around the places where they are feeding will soon destroy them.

The Fruit-tree Leaf-Roller (*Cacoecia argyrospila*, Walk.) is very abundant throughout the orchards of Missouri, feeding on the young leaves, and later does some damage to the fruit. Codling moth sprays, if carefully made and very carefully used, are good remedies for this pest, although it is somewhat difficult to get at under its leaf shelter. The Lesser Apple Leaf-Folder (*Teras minuta*, Robs.) is chiefly a pest of nurseries. Arsenical sprays are the best remedies and the first brood should be destroyed if possible, by spraying as soon as the moths appear.

The Spotted Tentiform Leaf-Miner (*Ornix prunivorella*, Cham.) is the most important of a number of leaf-miners found in

Missouri, and in the past year has been exceedingly abundant and troublesome in apple orchards. Remedies for this type of pest are not easily found; poison will not reach it inside the leaf and the complete destruction of the foliage in winter seems to be the only method of stamping it out.

The Codling Moth (*Carpocapsa pomonella*, L.) last year destroyed from one-third to one-half of the Missouri apple crop. It has been found that if the fruit is sprayed a week or 10 days after the blossoms fall with a high pressure and a fairly coarse spray, the cups at the blossom end of the apple will retain the poison for the pests which begin to arrive a week or 10 days later; if thoroughly done, this will do more to control the pest than any other measure. A second application is desirable 2 weeks later and a third 6 weeks later, so as to catch some of the second brood. The destruction of windfalls is important. The same remedy will serve against the Lesser Apple-Worm (*Enarmonia prunivora*), the life-cycle of which is almost identical with that of the Codling Moth.

The Plum Curculio (*Conotrachelus nenuphar*, Hbst.) is a more important pest of the apple and peach than of the plum, and is perhaps the most serious fruit pest in Missouri. The insect is a native and was first found to be attacking wild plums. It is exceedingly difficult to control. By spraying in spring, when the beetles begin attacking the fruit, the majority of them will be destroyed. The spray should be given within a week after the blossoms fall, and then again a week or 10 days later. Cultivation for the orchards in July and August is useful, as if the soil is well broken up, the pupal cases are brought to the surface and destroyed. Windfalls should be carefully collected.

The Plum Tree Aphid (*Aphis prunifoliae*, Fitch) is most destructive in the early spring. Thorough application of 10 per cent. kerosene emulsion or some nicotine preparation will destroy it. Winter spraying with lime-sulphur will usually destroy the eggs and prevent trouble in the spring. Plum Lecanium Scales (*Lecanium* spp.). There are 3 species of these scales found on plums, but only one is troublesome in Missouri. Where not very numerous the pest can usually be checked by pruning out infested branches, otherwise the usual San José Scale methods should be employed.

The Pear Blister Mite (*Eriophyes pyri*, Pgst.) can only be detected in the early summer by the small brilliantly coloured gall-like forms on the foliage. There are several species, but that dealt with is by far the most important. Oils and lime-sulphur, as used for scales, will generally prove efficacious; one application should be given in the autumn, just as the leaves are falling, and a second in spring, just before the buds open; summer spraying is of little avail. A careful pruning in the early spring is often useful.

The Pear Tree Psylla (*Psylla pyricola*, Först.) is easily controlled by the use of kerosene emulsion diluted with about 15 parts of water, and one careful application about the middle of May will usually suffice, though in bad cases it may be necessary to repeat it. Arsenate of lead (2 lb. to 50 gals. of water) is

recommended for destroying the Pear Slug (*Eriocampoides limacina*, Retz.). The complete life-history of the Black Peach Aphis (*Aphis persicae-niger*, E. F. Smith) is not properly known. It is primarily a root pest, and has been troublesome in many of the southern peach-growing districts, having been reported upon nursery stock in Missouri, though, up to the present, the amount of damage done by it in the State is not great but it probably will increase in the near future. All young trees received from the nursery should be fumigated or thoroughly dipped. A strong solution of tobacco decoction is probably the best dip to use and the grower can thus usually delay the arrival of the pest for many years. Once it has entered a young orchard, the soil should be cleared away from the base of the infested trees, a pound of ground tobacco strewed round them and the soil replaced. The pest presents the same difficulties as the woolly aphid of the apple; the best results will probably be secured by careful cultivation of the orchard and by providing the trees with an abundance of food so as to be able to stand the attack of the pest.

The Peach-Tree Borer (*Sanninoidea critiosa*, Say) is primarily a pest of young trees and if they can be kept free for the first 3 or 4 years after they are planted out, the later injury is not usually important, but the damage to very young trees is often very great. Insecticides are practically useless once the pest is established, and the best method of control is to select an orchard site as far from infested trees as possible and to inspect each tree planted. Following this with careful cultivation and regular inspection for borers, the young orchard can generally be kept in good condition. The most effective and cheapest method of cleaning up a badly infested orchard is to cut out all the larvae between September and December; then in May repeat the operation, and thoroughly spray the trunk for 2 ft. up and 6 or more inches below the ground with a solution of lime-sulphur of the strength used for winter spraying for San José Scale with double the quantity of lime and 1 lb. of arsenate of lead to every 5 gals. of the preparation.

The Terrapin Scale (*Eulecanium nigrofasciatum*, Perg.) can be kept under control by spraying in late autumn or spring with a strong solution of lime and sulphur, but oil washes seem to give better results. Nothing can be done in summer, because the strength of the wash required would seriously damage the leaves. This pest is becoming very troublesome in many parts of the State of Missouri, and in the author's opinion special control measures will have to be considered.

Peach orchards which are thoroughly sprayed for scale or Curculio do not suffer much from Peach Twig Borer (*Anarsia lineatella*, Z.). Winter sprays of oil or lime-sulphur seem to penetrate the hibernating cells and destroy the caterpillars. Early spring spraying with poison for the Curculio will also reach the majority of those feeding upon the developing shoots.

The Black Cherry Louse (*Myzus cerasi* F.) and the Cherry Scale (*Aspidiotus forbesi*, Johns.) are not serious pests and are easily controlled by the usual washes.

The Quince Curculio (*Conotrachelus crategi*, Walsh) is almost completely protected from treatment by poisoned sprays. For

a week or two in the early summer, when the pest is in the resting stage, many may be destroyed by surface cultivation and by careful collection. The destruction of windfalls, either by hand or by allowing the pigs to run in the orchard, will check the pest. The jarring method is also of some value. The beetle is altogether more difficult to handle than the Plum Curculio, but fortunately its work seems to be largely confined to the fruit of the quince.

The Praying Mantis (*Stagmomantis carolina*) is, in the author's opinion, one of the most important beneficial insects in the orchards of Missouri and is common in the State. The eggs are deposited late in autumn in oval packets cemented to twigs and other objects and many are destroyed instead of receiving the protection and encouragement which is their due, as each packet contains 100 or more eggs and every insect which feeds throughout the summer may, under favourable conditions, save several dollars worth of fruit.

The report concludes with some general remarks on the value of Coccinellids, *Chrysopa*, Syrphids and certain Hymenopterous and Dipterous parasites.

SCHIOENE (W. J.). Zinc Arsenite as an Insecticide.—*N.Y. Agric. Expt. Sta., Geneva, N.Y.*, Tech. Bull. no. 28, March 1913, 15 pp.

This is a report of a series of experiments with zinc arsenite and lead arsenate to determine their relative toxicity to insects and the safeness of the former for use on foliage. One pound of it proved equal to three pounds of lead arsenate. Zinc arsenite when added to calcium hydrate or Bordeaux mixture caused no injury to apple foliage; but more or less spotting of apple leaves occurred when the poison was used alone or in combination with lime-sulphur or glucose. Zinc arsenite alone or with glucose caused severe burning of grape foliage. Laboratory tests suggest that the injury to foliage may be due in part to the solubility of the poison in carbonic acid. The contradictory results from the use of this poison on foliage suggest that the manufactured product is not stable or uniform.

Zinc arsenite or lead arsenate with Bordeaux mixture, soap or glue, continued effective for twenty-five days. Either of the poisons alone, or with glucose, gradually lost its poisonous properties on exposure to weather and by the end of this period had ceased to protect the foliage.

Incidentally, it appears in these tests that the lime-sulphur solution does not resist wet weather as well as Bordeaux mixture.

A list of results of previous experiments with zinc arsenite by various authors in different parts of the United States is given. The experiments were made upon *Lina scripta*, *Mamestra picta* and *Hyphantria cunea* in the laboratory, and on the Spiny Elm Caterpillar (*Vanessa antiopa*) and the larvae of the Willow Beetle (*Lina scripta*) in the open. The insects as a rule ate only one meal on freshly sprayed foliage and fed very little afterwards until death ensued, and in all cases the amount consumed in the initial meal was greater with the check than with any of the

sprayed plants, indicating that either there was a reaction by the insect to the poison or that the spray possessed distasteful properties. In the tests in which foliage had been exposed to the weather, the period of feeding was more extended, depending on the interval between spraying and the feeding. Twenty-five days after spraying, caterpillars fed voraciously for two to six days before the poison became effective.

Details are given as to the effect on vine foliage of various sprays.

URICH (F. W.). Beetles affecting the Coconut Palm.—*Proc. Agric. Soc., Trinidad and Tobago*, xiii, pt. 4, 3rd March 1913, pp. 164-167.

The principal beetles which damage the coconut palm in Trinidad are the Gru-gru beetle and the Bearded Weevil, and in a less degree the Rhinoceros beetle. The Gru-gru beetle generally attacks palms that have been injured by a cutlass or broken by the wind or by fronds falling from taller trees. In these cases the injury may not be noticed and the beetle is credited with attacking a healthy tree, but this can hardly be its normal habit, because if it were not rare and exceptional there would not be a single coconut palm left in the island. The practice of using the larvae as table delicacies should keep down the beetles. Gru-gru beetles (*Rhynchophorus palmarum*) also attack palms affected by root disease or bud-rot and will only attack the soft tissues. The Bearded Weevil (*Rhina barbirostris*) makes tunnels in the hardest parts of the stem, but appears principally to attack palms that are suffering from fungoid disease or which have been burnt; the amount of damage done is not very great, the only danger being that the stem may occasionally be weakened and the tree snap off in a gale. Whenever these weevils are numerous it is a sure sign that the tree is attacked by fungi or bacteria and it would be better to fell or burn it.

The natural enemies of the Gru-gru beetle are larvae of the Histerid beetle, *Oxysternus maximus*. A Tachinid fly (undetermined) has been bred from the larvae of the Bearded Weevil. A species of *Xyleborus* also attacks palms, but only burnt trees or those which are suffering from fungoid disease. Two species of Weevil Borers, *Metamasius obsoletus* and *M. hemipterus*, are generally found associated with the Gru-gru beetle. Healthy palms are apparently not attacked. The coconut scale, *Aspidiotus destructor*, is restricted, but is generally injurious when associated with the Balata Ant (*Azteca chartifex*). When the ants are absent Coccinellid beetles are an efficient check.

MAXWELL-LEFROY (H.) & FINLOW (R. S.). Inquiry into the Insecticidal Action of some Mineral and other Compounds on Caterpillars. — *Mem. Dept. Agric., India, Pusa, Entom.* Series iv, no. 5, March 1913, pp. 267-327.

This paper gives the detailed results obtained in a large series of tests of poisons on caterpillars. These experiments were made

in the hope of finding a substitute for arsenicals, and their practical outcome has been the selection of lead chromate as a standard stomach poison to replace arsenical poisons. Accuracy was sought to be obtained by using as far as possible chemically equivalent amounts of each compound. A list of the insects used as subjects, and instructions for the preparation of naphthalene emulsion and of copper borate on a large scale are to be found in appendices.

FAUCHÈRE (E.). *Le ver à soie. [The Silk-worm.]—Bull. Economique, Tananarive, Madagascar, xiii, no. 1, 1913, pp. 92-111.*

Monovoltine breeds of silk-worm (*Bombyx mori*) introduced into Madagascar after a certain time become polyvoltine, a phenomenon recorded by Natalis Rondot in the case of silk-worms imported into Guatemala. Vice versa, polyvoltine strains introduced into Europe from tropical countries become monovoltine, so that it is inexpedient to adhere to the term 'race' and advisable to speak of silk-worms adapted to temperate or tropical climatic conditions. Results obtained in the interior of Madagascar and Réunion tend to show that acclimatised strains, producing five or six generations per annum, if properly cared for, produce silk of a quantity and quality equal to that obtained from French silk-worms. A discussion of climatic conditions in Madagascar leads the author to the conclusion that the production of silk from *Bombyx mori* may be undertaken in all tropical countries, even if they are very hot and very humid. However, one cannot hope to produce cocoons of the first quality except in the mountainous parts of these countries, where the temperature is not too high and there are frequent winds, all conditions which coincide admirably with those obtaining in Central Madagascar. There it is possible to rear five generations, but the generation hatching during the cold season cannot be used for silk. The period between hatching and harvesting the cocoons is about 45 days.

The buildings in which the silk-worms are to be reared (magnaneries) must be erected on an eminence well exposed to the wind and away from moisture. The wood used must be smooth, in order not to harbour parasites. Except in the case of a new 'magnanerie' it is imperative to disinfect the latter before rearing each generation, either by applying limewash or copper sulphate solution, or by fumigating with formaldehyde or sulphur dioxide. The silk-worm eggs hatch from 12 to 13 days after they are laid, and the young silk-worms thrive best at a temperature of about 20° C. At the Sericultural Station at Tananarive the temperature falls to 17° in the mornings during October and April, and at higher altitudes, as in Ankaratra, it is necessary to resort to artificial heating. From observations made at the Sericultural Station at Nanisana it appears that about 545 kilograms of carefully selected and cleaned mulberry leaves are necessary for rearing the larvae from 25 grams of eggs. After a thorough discussion of rearing methods, the author proceeds to

give an account of parasites and enemies of the silk-worm, especially of pebrine, muscardine, flacherie and grasseerie, the chief remedies against silk-worm diseases being scrupulous cleanliness, avoidance of fermented leaves, etc. Among the predatory enemies of the silk-worm in Madagascar ants, rats and mice have to be guarded against. The silk-worm fly (Uji in Japan, Kuji or Connhang in Indo-China) is fortunately unknown on the island, but a related species attacks *Berocera madagascariensis*.

JACK (R. W.). Insect Pests of Tobacco in Southern Rhodesia.—
Dept. Agric., Salisbury, Rhodesia, Bull. no. 140 (N.D.),
18 pp., 7 pls.

The most troublesome pests of tobacco in Southern Rhodesia are the cut-worms, especially in the seed-beds; the stem-borer, *Phthorimaea heliopa*; and the so-called wire-worms sometimes cause serious and unexpected loss. There are several species of cut-worms which are more or less injurious, *Euxoa segetum* and *Agrotis epsilon* being particularly active. It has been observed that some of these larvae are capable of fasting for several weeks together and the duration of the larval stage is thus very variable. The pupal period of some of these species also varies, in one species from 12 days to 6 weeks.

To ensure that the seed-beds are free from cut-worms when the seed is sown, they should first of all be thoroughly burned over with wood or dry tobacco-stalks: but this is not sufficient, because of the presence of cut-worms in the neighbouring ground, and the use of poisoned bait made of molasses 2 qts., Paris green 1 lb., and maize meal or wheat bran 50 lbs., is said to be effective, as also is the Mally formula used in Cape Colony. The author further recommends the growing of lettuce or some other hardy vegetable to furnish green-stuff for baiting purposes. It must be borne in mind that the tobacco seed-beds in October and November present a large area of succulent vegetation when this is scarce elsewhere, so that the cut-worms are attracted from considerable distances round. The ground should be cleared for 30 yards in all directions round and this cleared area should be thoroughly baited before sowing. Whatever form of bait is used it should be distributed in the evening so as to avoid the drying effect of the sun. The bait is most effective the first night and if the ground treated has been cleared for some little time the cut-worms, being hungry, will be poisoned in large numbers. The baiting should be repeated a week later.

To protect the beds from infestation after the plants are above ground, the greatest care should be given to the soundness of the covering material, to its proper adjustment each night, and to the tightness of the bricks enclosing the beds; the object being to exclude the adult moths and prevent the depositing of eggs on or near the plants. Clean cultivation is a great preventive remedy. If the seed-bed becomes infested it is exceedingly difficult to destroy the larvae, and the bait, although evenly distributed, does not entirely prevent damage. Cut-worms can be collected by natives, who show special aptitude for this work,

and a few good "boys" are capable of rendering the use of insecticides unnecessary. Each half-grown cut-worm destroyed can be reckoned as a score or more plants saved.

The Stem Borer (*Phthorimaea heliopa*, Lwr.) is a native of South Africa but is also recorded as damaging tobacco in India. The damage done in Southern Rhodesia to the seed-beds is serious, for the seedlings are frequently attacked when quite small. The presence of the larvae in the stem causes a swelling to form and above this swelling the plant will not grow. Suckers grow out from beneath the swollen portion of the stem, but, if unaided, practically no leaf worth reaping is produced. The preventive methods consist in the protection of the seedlings in the beds from the moths, and discarding all seedlings that show swellings when planting out. All stray tobacco plants round about the seed-beds should be destroyed, as they provide breeding places. Remedial measures are not practicable, though it is said that if the plant is severed below the swelling and all but the strongest suckers removed, a fair amount of leaf will be produced, provided the plant is young enough.

The Tobacco Miner or Split Worm (*Phthorimaea operculella*) chiefly attacks the leaves and although found in the stems is not known to produce any swellings. The insect is also a bad pest of potatoes. The eggs are laid singly on the plant, hatching in from 6-10 days and the larvae eat out the substance of the leaves in irregular patches. They have a habit of leaving old mines and starting new ones, and this habit is of some importance in connection with control measures. The pupal stage is passed inside the plant and the moth, under favourable conditions, emerges about five weeks from the hatching of the egg. The lower leaves are those chiefly attacked, and as tobacco from Southern Rhodesia is not at present grown for the purpose of making cigar wrappers, the injury is not of the same importance as in some other tobacco-growing countries. Much good leaf is, however, liable to attack and it is no uncommon sight in the barn to see hundreds of these caterpillars hanging by threads from the drying leaves or crawling rapidly over the ground in endeavours to escape the uncomfortable heat. Preventive measures consist in covering the seed-beds thoroughly at night and destroying all plants which may serve as breeding places for the moth during the winter. The insect breeds in the thorn apple or "stinkblaar" (*Datura stramonium*) and this should be destroyed as much as possible in the neighbourhood of tobacco lands. Spraying with arsenate of lead or Paris green might possibly destroy many of the insects when starting new mines.

The caterpillars of *Laphygma exigua* are also injurious to tobacco in Southern Rhodesia, but in ordinary years it has been found that they can be kept under sufficiently by collection and destruction during topping operations. In some seasons they appear in too great numbers to be left so long, and in the absence of spray pumps the whole labour on the farm has to be devoted to this work. The author strongly advises growers to keep a few pumps of the knapsack pattern on hand in case of a bad invasion, and says that the most suitable spray is: Paris green 1 lb., fresh slaked lime 2 lb., water 160 gals.

The Bud-worm (*Chloridea obsoleta*) does not yet attack the buds and injury to seed-capsules, although common, is not at present of great consequence as seed is not collected in Rhodesia. Beetles belonging to the following genera have been observed or reported as damaging tobacco: *Zophosis*, *Gonocephalum* (*Opatrum*), *Psammodes* (tok-tokje), *Dietha* and *Anomalipus*. Of these the most to be feared are *Zophosis* and *Gonocephalum*. These beetles will apparently gnaw any part of the plants within reach. Deeply set plants in which the growing heart is well underground escape serious damage, even when the beetles are abundant. The use of grass dipped in cut-worm poison is efficacious bait. *Gonocephalum* can be trapped under heaps of rubbish, which may be burnt.

A large Cricket is also occasionally a troublesome pest of tobacco. It is undoubtedly associated with the crop because of its preference for light sandy soils rather than because of any special preference for tobacco. These insects sever the leaves and drag them to their burrows. Grasshoppers of various species attack tobacco in the seed-beds and in the fields chiefly in the early part of the season. Arsenical sprays are useful against them.

The Cigarette Beetle (*Lasioderma serricorne*) is well known in Rhodesia, and 24 hours fumigation with carbon bisulphide at the rate of 1 lb. to 1,000 cubic feet of space is recommended. The author says that bales should be opened up to enable the gas to penetrate. *Tribolium confusum* is usually a pest of grain and farinaceous products, but in Rhodesia it has also been recorded as attacking stored tobacco.

JACK (R. W.). The Bean Stem Maggot.—*Dept. Agric., Salisbury, Rhodesia, Bull. no. 142, April 1913, 9 pp., 4 pls.*

This insect has been described as *Agromyza fabalis* by Mr. Coquillet from specimens bred from bean stems at Rosebank, near Capetown, and appears to be generally distributed south of the Zambesi, having proved injurious in centres so widely separated as Capetown and Salisbury. So far as the author is aware, this is the first notice of its habits and the injuries caused by its attacks.

Under cage conditions the development of the insect occupies 36 days, of which 20 are taken up by the egg and larva and 16 by the pupa. Three days after emergence the fly deposits its eggs in the leaves of young plants, the larvae subsequently making their way into the stem and congregating at its base. Decay may set in and the plant die suddenly; 20 to 30 per cent. and more of the young plants of certain varieties of cowpeas have been seen to die off in this way. Stronger or less heavily infested plants survive and the wounds heal, with the result that a swelling is formed at the base of the stem; even then the growth of the plant is often practically stopped. Others grow fairly well, but are stunted, the plant being bushy and the internodes short. These remarks apply chiefly to cowpeas and beans grown as crops. French beans in gardens, which are used in the green state, do

not suffer so badly, but the young plants are sometimes killed and still more frequently stunted. The author says that on every farm where cowpeas or kafir beans have been planted in the Marandellas district all the plants showed the results of wholesale infestation. On one farm near Salisbury 14 acres of haricot beans had been completely ruined and in other places considerable damage from the pest was observed.

Soya and velvet beans are not attacked at all, the host plants of this insect appearing to be those of the genera *Vigna* and *Phaseolus*, which have a considerable number of common wild representatives in Rhodesia, and without doubt these formed the natural hosts of the maggot before the introduction of cultivated varieties; it is the presence of these wild plants that makes the task of controlling the pest difficult. Certain varieties of cowpeas appear to be much more resistant than others. In the experimental plot at Salisbury most young plants of "Iron" were lost; "Black-eyed Susan" was very badly damaged; "Whip Poor Will" and an unnamed variety secured a fair stand, but many plants died; while "Natal Black" and "New Era" thrived best. Kafir beans were noticeably more resistant than most imported cowpeas, although young plants frequently died from the attack. The maggot is extensively parasitised by a species of Braconid wasp.

The cowpea is grown as a secondary rotation crop in order to renew the nitrogen content of the soil and is not sufficiently valuable in itself to bear the expense of treatment. Liberal manuring has a good effect, as it induces vigorous growth and consequent resistance to injury. Complete infestation of crops may occur the first time that they are planted on new farms. Possibly a trap crop of cowpeas, sown with the first rains along the edge of the land intended for the main crop and ploughed under after about three weeks growth, would serve to reduce the initial infestation of the main crop. The author thinks that the discovery or production of varieties which will grow and yield a good crop in spite of the infestation with this pest is by no means improbable.

SCHOENE (W. J.) & FULTON (B. B.). **Apple Insects.**—*New York Agric. Expt. Station, Geneva, N.Y.*, 25th April 1913, Circular no. 25, pp. 11, 11 figs., 4 pls.

The insects dealt with in this circular are the following:—Pistol Case-bearer (*Coleophora malivorella*, Riley), Cigar case-bearer (*C. fletcherella*, Fern.), Bud Moth (*Tmetocera ocellana*, Schiff.), Oblique-banded Leaf-roller (*Archips rosaceana*, Harris), Fruit-tree Leaf-roller (*Archips argyrospila*, Walker), Apple Bugs (*Heterocordylus malinus*, Reut., and *Lygidea mendax*, Reut.), Green Fruit Worms (*Xylina* spp.), Codling Moth (*Cydia pomonella*, L.), Lesser Apple Worm (*Enarmonia prunivora*, Walsh), Palmer Worm (*Ypsolophus pometellus*, Harr.), Plum Curculio (*Conotrachelus nenuphar*, Herbst.), White-marked Tussock Moth (*Hemerocampa leucostigma*, Sm. & Abb.), Apple Maggot (*Rhagoletis pomonella*, Walsh), Gipsy Moth (*Lymantria dispar*, L.) and Brown-Tail Moth (*Euproctis chrysorrhoea*, L.).

A brief life-history is given of each and short directions for treatment, and the circular concludes with instructions for the application of lime-sulphur wash as a general insecticide throughout the year.

DUBOIS (Dr. A.). *Pour la protection des oiseaux.* [Bird protection.]—*Bull. Soc. Zool. France*, xxxviii, no. 4, 23rd May 1913, pp. 127-133.

A plea for the protection of insectivorous birds in France from dealers (millinery and game) and a review of legislation in various countries. The Belgian bye-laws prohibiting the killing, buying, selling or carrying of insectivorous birds are reprinted in full.

La finezza degli zolfi destinati ad uso agricolo. [The fineness of sulphur intended for agricultural purposes.]—*L'Agricoltura Moderna*, xix, no. 10, 29th May 1913, p. 116, 3 figs.

The relative degrees of fineness of three commercial brands of sulphur for agricultural purposes are discussed in this article and the importance of extreme fineness in order to secure the best results is insisted upon. Three micro-photographs are reproduced (1) of ordinary ground sulphur (60° fineness, Chancel), (2) sulphur which has been graded by the use of fans 85° - 90° Chancel), and (3) of sulphur prepared by a special process (100° Chancel). The relative fineness may be expressed as follows:—178,000 particles of No. 1, 22 millions of No. 2, and 36 millions of No. 3, are respectively required to weigh one gramme. It is pointed out that there are many other brands in the market which are very much coarser than any of these and that the use of an exceedingly fine sulphur may result in economy estimated at from 30 to 50 per cent., the coarser varieties being very largely ineffective, owing to the larger grains falling off the plants and taking no part in the chemical action on which the use of sulphur for dusting purposes is based.

CHITTENDEN (F. H.). *The Spotted Webworm.*—*U.S. Dept. Agric., Bureau of Entom.*, Bull. no. 127, 31st May 1913, 11 pp., 4 pls., 3 figs.

The author says that this pest (*Hymenia perspectalis*, Hübn.) attracted his attention on two occasions from its occurrence on beets in the District of Columbia. He says it is somewhat singular that it was first observed in 1905 and was not again noticeable until 1912, when it became a veritable pest. It may be classed both as an enemy of sugar-beet and as an insect injurious to ornamental plants in garden and greenhouse. The moth, larva and eggs are described and the distribution throughout the world is given. Nothing is known of the origin of the species and it is uncertain whether it comes from the Old or the New World, but it has obviously been introduced into the United States.

The species is not known in Europe, but will probably in time become cosmopolitan; the other known species are African. The larvae are apparently of nocturnal habits and during the day conceal themselves about the bases of the plants.

The following beetles are apparently associated with the larva: the Yellow-necked Flea-beetle (*Disonycha mellicollis*, Say) and the Spinach Flea-beetle (*D. xanthomelana*, Dalm.). In a single instance the Hawaiian Beet Webworm (*Hymenia fascialis*, Cram.) was reared from Swiss cardoons with the Spotted Webworm at Washington, D.C. The species is recorded by Marsh as attacking table and sugar beets, stock beets or mangel-wurzels, and several other cultivated and wild plants. The only parasite observed was a single Braconid (*Hemiteles* sp.). The author says that injury was discovered too late for the application of insecticides and suggests that the remedies used against the Hawaiian Beet Webworm will probably prove effective.

A brief bibliography concludes the bulletin.

DURRANT (J. H.) & BEVERIDGE (Lt.-Col. W. W. O.). A Preliminary Report of the Temperature reached in Army Biscuits during Baking, especially with reference to the Destruction of the Imported Flour-moth, *Ephestia kühniella*, Zeller.—*Jl. Roy. Army Med. Corps, London*, xx, no. 6, June 1913, pp. 615-634, 7 plates.

For some time past it has been observed that ration biscuits exported to the colonies have, after a time, become quite unfit for consumption owing to the ravages of certain moths and beetles. This has been especially noticed in South Africa, Ceylon, Gibraltar, Malta, Mauritius, and the Sudan. This enquiry was undertaken in order to ascertain: (1) how and when infestation of biscuits takes place; (2) whether any steps can be taken to avoid, or minimise such infestation.

The insects met with during this inquiry are all widely distributed species, whose range has been doubtless greatly extended by commerce. All are known to occur in England.

Injurious Insects.

LEPIDOPTERA: *Ephestia kühniella*, Z., *E. cautella*, Walk., *E. elutella*, Hb., *Corecyra cephalonica*, Stn.

COLEOPTERA: *Silvanus surinamensis*, L., *Trogoderma* sp., *Sitodrepa panicea*, L., *Lasioderma serricorne*, F., *Rhizopertha dominica*, F., *Ptinus tectus*, Boiel., *Trikolium castaneum*, Hbst., *T. confusum*, Duv., *Tenebrioides mauritanicus*, L., *Calandra oryzae*, L., *C. granaria*, L.

Beneficial Insects.

HYMENOPTERA: *Bracon brevicornis*, Wesmael.

COLEOPTERA: *Tenebrioides mauritanicus*, L.

All the above species were obtained from tins of biscuit, with the exception of *Ptinus tectus*, *Trogoderma* sp., *Gnathocerus*

.cornutus and *Calandra granaria*, which were found amongst loose material, such as flour and grain, and might be expected to occur in the tins. No trace was noted of the moths *Pyralis farinalis*, L., *Plodia interpunctella*, Hübn., *Sitotroga cerealella*, Ol., or *Tinea granella*, L., or the beetles *Palorus melinus*, Hbst., and *Latheticus oryzae*, Waterh.

With a view to determining the origin of infestation, sample tins were withdrawn from stocks at various stations abroad for inspection at Woolwich by experts, and tins which, after careful examination, had been pronounced intact, were found to contain *Ephestia kühniella*, etc., in various stages of development, proving conclusively that infestation had taken place in the factories before the tins were soldered and showing that preventive or remedial measures must be taken in the factories themselves. The following considerations present themselves: either, the heat of the biscuit in the process of baking is insufficient to destroy ova present in the moist dough, or moths and beetles deposit their ova in or on the biscuits after baking and during the process of cooling or packing the tins. Cooling before packing is necessary to allow the moisture in the centre of the biscuit to become evenly distributed, and it is during this cooling process that the biscuit is exposed to the greatest risk of infestation.

The flour as received is often infested by insects in various stages, and it has been suggested that the heat of baking is not sufficient to sterilise the interior of the biscuit, and some attempt has been made during these investigations to determine exactly what occurs. A somewhat complicated thermo-electrical apparatus was used by the authors to determine the interior temperature of biscuits during the process of baking, and this is carefully described. They found that ova which had been exposed to a temperature of 69° C. for twelve minutes, failed to survive, and that the temperature of the interior of a biscuit reached 100° C. and more. The authors think it exceedingly unlikely that the ova can withstand the temperatures reached and maintained during the process of baking, and they are, therefore, of opinion that infestation must take place after baking, during cooling, and prior to the tins being soldered.

They have considered the practicability of destroying insect life after packing by puncturing the biscuit tins before leaving the factory, raising the temperature to a lethal point and then re-soldering. There are, however, technical difficulties and also the question of added expense.

Until the temperature destructive to the ova of the moth *Ephestia kühniella* (which may be considered as representing other species) has been actually determined, the only practical suggestions which the authors can offer are that the temperature conditions during cooling should be rendered as uncomfortable as possible for the moths, by introducing screened cooled air which should be continually withdrawn by revolving fans, suction or some other similar contrivance. They think this would more rapidly cool the biscuits and also render it practically impossible for the moth to oviposit on them. It is also suggested

that the attention of the Board of Agriculture should be drawn to the advisability of protecting the Trade by scheduling *Ephestia kühniella*, *Corecyra cephalonica*, and perhaps other species also.

The authors conclude their paper with an historical account of *Ephestia kühniella* and its distribution, and come to the conclusion that this species has probably been introduced into Europe and the United States from Central America.

The authors say that the species of Lepidoptera which most seriously infest army biscuit are *Ephestia kühniella*, Z., and *Corecyra cephalonica*, Stn., but *Ephestia elutella*, Hb., and *Ephestia cautella*, Walk., have been found almost equally destructive to some samples. It would seem that *Corecyra cephalonica* is a less serious pest than *Ephestia*, for if the percentage of moisture present in the biscuit be considerably reduced, the young larvae of the *Corecyra* are unable to bite the dry biscuit and die of starvation—this has not been found to be the case with *Ephestia*.

The paper is illustrated by very excellent plates and contains popular and scientific descriptions of these species with full references to the literature. A list of parasites bred from *E. kühniella* is also given.

VERMOREL (V.) & DANTONY (E.). Préparation des Bouillies Alcalines Mouillantes. [Preparation of alkaline sprays of high wetting power.]—*Progrès Agricole et Viticole*, xxx, 15th June 1913, pp. 745-746.

The authors give the following recipes in response to numerous requests for information as to the preparation of alkaline spray mixtures depending for their wetting power upon the addition of casein.

Bordeaux Mixture. Solution (A): Dissolve $4\frac{1}{2}$ lb. of sulphate of copper in 20 gallons of water. Solution (B): Slake 2 lb. of good stone lime slowly and carefully with a small quantity of water; carefully stir into 2 gallons of water, so as to obtain a homogeneous milk of lime. This mixture is to be poured gradually and with constant stirring into the solution (A) and tested continually with test paper; as soon as the test paper becomes blue the addition of milk of lime must be stopped. In order to increase the wetting power of this mixture 2 pints of solution of casein is to be added. This solution is prepared as follows:—2 oz. of quicklime in fine powder and 1 oz. of casein in dry powder to every pint of water; thoroughly mix the quicklime and casein in a mortar and add sufficient water to form a paste, then stir in the rest of the water.

Burgundy Mixture (A): Dissolve 4 lb. of sulphate of copper in 2 gallons of water. (B) Dissolve 2 lb. of washing soda in 2 gallons of water. Pour (B) into (A) very slowly, stirring it vigorously all the time; as soon as the mixture is alkaline to test paper no more soda solution should be added. Make up to 20 gallons and add 2 pints of the solution of casein made as follows:—Dissolve 4 oz. of carbonate of soda in 2 pints of water; then mix 2 oz. of casein in fine powder with sufficient of this

solution to form a smooth paste, the remainder of the solution being added gradually in a mortar with constant stirring until the casein is thoroughly incorporated. The action proceeds more rapidly if the liquid is slightly warm. This mixture occasionally causes burning of the leaves.

Acid mixtures can have their wetting power increased by the addition of $\frac{1}{2}$ to $1\frac{1}{2}$ oz. of gelatine to every 20 gallons; the gelatine should be first dissolved in a quart of boiling water. Casein cannot be used with acid mixtures.

PÉNEAU (J.). Coleoptères de la Loire-Inférieure.—*Bull. Soc. Sci. Nat. de l'Ouest de la France, Nantes*, iii, no. 1, 31st March 1913, pp. 25-85, 1 pl.

An account of the Coleoptera of the Département of the Loire-Inférieure, containing remarks on numerous species of economic interest.

KIEFFER (Dr. J. J.). Glanures diptérologiques. [Dipterological gleanings.]—*Bull. Soc. d'Hist. Nat. de Metz*, (3) iv, no. 28, 1913, pp. 45-55.

As the title implies, this paper consists of miscellaneous notes, systematic and bionomic, on new Diptera. Of economic interest are the descriptions of *Phaenobremia cardui*, sp. n., preying on *Aphis cardui*, at Bitsch, Lorraine, and *Monobremia subterranea*, sp. n., preying on an *Aphis* which lives on the roots of *Tanacetum vulgare*, at Bitsch, Lorraine.

HERRICK (G. W.). The Asparagus Miner and the Twelve-spotted Asparagus Beetle.—*Agric. Expt. Station, Coll. Agric., Cornell Univ.*, Bull. 331, April 1913, pp. 411-435, 7 pls.

The Asparagus Miner is a native of America and closely resembles the Asparagus Fly of Europe, *Platyparea poeciloptera*, Schrank, which, however, is a borer and not a miner. Records of outbreaks are given, the insect being widely distributed in the eastern part of the United States, and in fact wherever asparagus is grown to any considerable extent, especially in New York, New Jersey, Pennsylvania, Maryland, Connecticut, Massachusetts, Long Island, District of Columbia, Tennessee, Virginia, and throughout California. The presence of the insect, and especially of its larva, is never very evident to the casual observer, unless the adult flies are congregated on the stalks and branches, but as no injury is apparent from their presence they are easily mistaken for visitors rather than recognised as pests. If a stalk that looks yellow at the base is pulled out, it will be found that the skin peels off very easily or is cracked, and if the observer traces some of the mines he will find in most cases a white maggot beneath the epidermis of the stalk. This yellowing of the stalk at the base, or the shrivelled appearance and premature yellowing of the entire plant, is a sure indication that the Asparagus Miner is present.

In one bed over 80 stalks were examined, and at least 3 puparia were found on every stalk, and as many as 12 on some. The adults appear in the spring and immediately begin to lay eggs on volunteer plants or in seedling beds, no attempt being made to oviposit on cutting beds. The egg, larva, pupa and adult are described and figured, and a table of the life-cycle is given. There are two broods in the year, adults appearing in the second half of May and laying eggs which hatch about the middle of June. The larvae pupate in July, and the second brood emerges about the end of the month. The pupae of the second generation remain over the winter to reappear in May of the next year. These facts apply to the neighbourhood of Ithaca, New York.

Flies were found to be killed by spraying with a solution of 1 part of potassium arsenate to 45 parts of water, with 12 lb. of syrup added. A mixture of 2 lb. arsenate of lead to 50 gallons of water and 12 lb. of syrup also proved effective against flies, but was slower in its operation. The author considers that spraying with tobacco extract (Black Leaf 40) in the proportion of 1 to 500, with an addition of 4 lb. of soap, is the best remedy against the larvae. A bibliography is given.

Crioceris duodecimpunctata, L. (Twelve-spotted Asparagus Beetle) was imported from Europe, though at what date is not known, and was first observed near Baltimore in 1881. Some account is given of its progress and distribution throughout the United States.

In the early spring the hibernating beetles begin to attack the young asparagus shoots in the same manner as *Crioceris asparagi*. Observations made at Ithaca failed to show any attack on cutting beds, though the beetles were found in large numbers on volunteer plants growing near a cutting bed. When the cutting season is over and the shoots have begun to branch out, the beetles feed mainly on the stalks and branches, gnawing the epidermis, and even the larger branches are entirely destroyed by them. Later, they feed to a large extent on the blossoms and berries. Egg-laying does not take place until after the asparagus plants have either blossomed or begun to form berries. The eggs are laid on the branches and hatch out in from 7 to 12 days. The larvae feed only on the berries, and after the second moult a larva can eat the entire contents of a berry within twenty-four hours or less, and before completing its growth it may destroy as many as four berries. This is a cause of serious loss to seed-growers. The larvae become mature in a week or 10 days. Pupation lasts from 12 to 20 days, and in the neighbourhood of Ithaca adults emerge about 20th July. Second brood eggs are laid about 1st August, and the larvae hatch out about 9th August. The author suggests as remedies—although no experiments were conducted—spraying the berries with arsenate of lead as soon as they are formed, so as to poison the larvae at their first meal, but thinks that spraying with arsenate of lead 2 lb., water 50 gallons, with the addition of 2 to 4 lb. of soap, or of 12 lb. of syrup when the Asparagus Miner is present, will effectively destroy the beetles before they have had a chance to deposit their eggs.

A lengthy bibliography from 1758 to 1910 concludes the article.

CROSBY (C. R.). A Revision of the North American Species of *Megastigmus* Dalman.—*Annals Entom. Soc. Amer., Columbus, Ohio*, vi, no. 2, June 1913, pp. 155-170, 10 figs.

So far as known, the larvae of all North American species of *Megastigmus* (CHALCIDIDAE) live in the seeds of plants:—*M. aculeatus*, Swed.—rose seeds; *M. albifrons*, Walk.—seeds of *Pinus ponderosa*; *M. brevicaudis*, Ratz.—seeds of *Sorbus*; *M. borriesi*, Crosby—seeds of *Abies mariesi* from Japan; *M. flavipes*, Ashm.—unknown; *M. lasiocarpae*, Crosby—seeds of *Abies lasiocarpa*; *M. nigrovareiegatus*, Ashm.—rose seeds; *M. physocarpi*, Crosby—seed capsules of *Physocarpus opulifolius*; *M. pinus*, Parfitt—seeds of *Picea bracteata*, *Abies nobilis*, *A. magnifica*, *A. grandis*, *A. concolor*, *A. amabilis*; *M. spermotrophus* Wachtl—seeds of *Pseudotsuga taxifolia*, *Abies magnifica*, *A. grandis*, *A. amabilis*, *A. concolor*; *M. tsugae*, Crosby—seeds of *Tsuga mertensiana hookeriana*.

DE SALAS Y AMAT (L.). Les plagas del naranjo y limonero en España. 1912, 196 pp., 8 figs. [Scale Insects injurious to Orange and Lemon in Spain.]—*Mthly. Bull. Agric. Intell. & Plant Diseases, Rome*, iv, no. 6, June 1913, p. 968.

The author gives the following list of the chief scale-insects of orange and lemon in Spain:—*Chrysomphalus dictyospermi* var. *pinnulifera*, in Valencia, Tarragona, the Balearic Isles, Murcia and Andalusia; *Aspidiotus hederae*, at Valencia and in Andalusia; *Parlatoria zizyphi*, at Valencia; *Lepidosaphes beckii* (*Mytilaspis citricola*), at Valencia and in Andalusia; *L. gloveri* and *Pseudococcus (Dactylopius) citri*, at Valencia and in Andalusia; and *Saissetia oleae*.

DAY (F. H.). *Bostrichus capucinus*, L., in Cumberland.—*Entom. Monthly Mag.*, London, June 1913, p. 136.

Last July and August the writer found a number of specimens of *Bostrichus capucinus* in an oak log, imported from Odessa in a roughly hewn state, but with the whole of the bark removed. The beetles were captured as they emerged from their cleanly cut burrows in the hard, perfectly sound wood. The author believes it is many years since this species was found really wild in Great Britain and suggests that the specimens may have originated from similarly imported parents.

DUBOIS (Dr. A.). Oiseaux et insects au point de vue économique. [Birds and insects from an economic point of view.]—*Bull. Soc. Zool. de France*, Paris, 1913, xxxviii, no 5, 27th June 1913, pp. 165-172.

This is a discussion of the results of a recent limited investigation into the food of wild birds in Belgium. The stomach contents of 231 insectivorous birds, referable to 18 species, were

examined, and it was found that only 7 species had eaten injurious insects. The author concludes that the importance of birds in this direction has been much over-estimated, and insists that parasitic and predaceous insects are of far greater value to the farmer and forester.

[It must be noted that for the great majority of species the number of stomachs examined is far too small to permit of reliable generalisations.—Ed.].

GIBSON (A.). *Flea-Beetles and their Control*.—*Dom. Canada Dept. Agric., Div. Entom.*, Entom. Circ. no. 2, Ottawa, 1913, 11 pp., 14 figs.

The Spinach Flea-beetle (*Disonycha xanthomelaena*, Dalm.) is fairly abundant in some seasons in Ontario and Quebec, but no serious complaint has been received as yet of damage to spinach or beet crops, which are attacked by it in the United States.

The Triangle Flea-beetle (*Disonycha triangularis*, Say) was especially destructive to beet some years ago in Ohio, Michigan, and elsewhere in the United States. It is common in Canada, but as yet can hardly be regarded as a pest.

The Alder Flea-beetle (*Haltica bimarginata*, Say) has been occasionally reported as injuring alder, poplar and willow. It is known all over Canada, from Nova Scotia to British Columbia and as far north as Fort Simpson on the McKenzie River.

The Grape Vine Beetle (*Haltica chalybea*, Ill.) attacks the tender buds of grape vines, which are often completely eaten, and occasionally the vines are killed. Grape-growers in Ontario have at times suffered serious loss. The eggs are laid in cracks of the bark, at the base of the bud, in cavities in the buds or even on the leaves themselves. The grubs hatch about the time the leaves expand, are full-grown in three or four weeks, and pupate in the ground, the beetles emerging in a week or two. As the beetles pass the winter beneath dead leaves and other rubbish, this should be carefully collected and burnt in autumn. The vines should be watched when the buds are forming and if the insects are present they should be heavily sprayed with Paris green or arsenate of lead. The author says that the buds will stand 1 lb. of Paris green in 75 gals. of water to which 1 lb. of freshly slaked lime has been added. The application should be renewed in a few days, or sooner if rain has fallen. Arsenate of lead has been used with success of a strength of 8 lbs. to 36 gals. of water. When the beetles are feeding on the leaves, the strength of the spray should be reduced to, Paris green 1 lb., water 160 gals.; or arsenate of lead 2 lbs., water 40 gals. This insect also attacks Virginia creeper.

The Strawberry Flea-beetle (*Haltica ignita*, Ill.) has done serious damage in the United States to strawberries, grapes and peaches. It was reported in 1910 as damaging strawberries at Nelson, B.C. The author thinks, however, that this is an error and that the species was *H. evicta*, Lec. The only record of injury by *H. ignita* in Canada was in 1910 at St Stephen, N.B.

The Bronze Flea-beetle (*Haltica evicta*, Lec.) appears to be constantly confused with the previous species and was wrongly reported as damaging turnips and cabbages at Half Way Lake, Alta., in 1911. In this case the species was *H. ignita*.

The Potato Flea-beetle (*Epitrix cucumeris*, Harr.) is one of the most destructive of the flea-beetles occurring in Canada, eating the leaves of potato and tomato, cabbages, cucumbers, beans, tobacco, squashes, pumpkins, wonder-berry and other plants. They are most numerous in hot, dry seasons. The pest has been reported from Ontario and from Vancouver. The beetles winter in dry sheltered spots, and the eggs are laid on the roots of Solanaceous weeds on which the larvae feed and pass the pupal state. Serious damage is done at the end of July or early in August.

The Red-headed Flea-beetle (*Systena frontalis*, F.) is very numerous in Ontario and other Eastern provinces. Its food-plants are very numerous, but it is particularly destructive early in the season to the leaves of potatoes, beans, young grapes and many varieties of deciduous shrubs. At Ottawa and Guelph they have damaged clover, and at Bryanston they have been found in corn fields, but the chief damage was done to mangel-wurzel.

The Black-margined Flea-beetle (*Systena marginalis*, Ill.) is occasionally recorded in Eastern Canada and considerable damage is done to certain forest and shade trees. At Ottawa the worst attack has been in August when the beetles destroy the leaves of elm, oak and hickory, and in one outbreak the leaves of the Service Berry (*Amelanchier canadensis*) were freely eaten.

The Pale-striped Flea-beetle (*Systena blanda*, Mels.).—In the United States this species frequently requires control as it damages corn, strawberry, melon, potato, carrot, beet, clover, etc. It is not recorded as having done serious damage in Canada though there have been small serious local outbreaks.

The Turnip Flea-beetle (*Phyllotreta vittata*, F.) is one of the commonest flea-beetles which attacks vegetables. The beetles pass the winter as adults and in the latter half of May and throughout June do great damage to young cruciferous plants, chiefly to the seedlings. There are two or three broods during the season and the species occurs generally throughout Canada.

The Horse-radish Flea-beetle (*Phyllotreta armoraciae*, Koch) was found in Chicago in 1893 and since then has been found at other places in the United States and in Canada. It was abundant and did great damage to horse radish at Montreal in 1912, this appearing to be the only cultivated crop seriously attacked.

The Hop Flea-beetle (*Psylliodes punctulata*, Melsh.) has cost the British Columbian hop-growers large sums of money. The beetles pass the winter in the trellis poles, under rubbish or under the surface of the soil. They become active in the end of March and throughout April, and in British Columbia there are two distinct broods in the year. The over-wintered females lay their eggs in spring and the beetles appear mostly in early June; the second generation in the end of July and throughout August.

A tarred board, or canvas stretched over a light wooden frame, 4 ft. long by 3 ft. wide, coated with tar and trailed through the gardens will, it is said, catch 85 per cent. of the beetles present. Tanglefoot bands may also be used after the hop vines have been trained.

The author gives the following chief methods of control: Bordeaux mixture or Paris green $\frac{1}{4}$ lb. to 40 gals. of water, with $\frac{1}{4}$ lb. freshly slaked lime. Arsenate of lead 2-3 lbs. to 40 gals. of water or both these arsenical compounds in the above strengths in combination with Bordeaux mixture. In the case of the Potato Flea-beetle Bordeaux mixture gives satisfactory results; when the number of beetles is great it may be necessary to spray twice a week or even oftener. Paris green 1 lb., mixed with 20 lbs. of land plaster, and dusted on to the plants early in the morning while they are still wet with dew is a good remedy. The land plaster stimulates the plants and the Paris green kills the beetles. This remedy is particularly useful against the Turnip Flea-beetle. In the case of cabbages it is inadvisable to use arsenical mixtures after the heads of the plants are half formed. The author advises the addition of 2 lbs. of resin, 1 lb. washing soda and 1 gal. of water, well boiled together, to 40 gals. of the spray above mentioned in order to secure better adhesion.

Tomatoes and such plants may be protected by dipping the tips only, when planting out, in 1 lb. arsenate of lead in 10 gals. of water. Beds of radishes screened by cheese-cloth covers are well protected against flea-beetles and root maggots. These may be made by cutting a barrel hoop in two, sticking the ends in the ground and stretching the cheese cloth over the intervening space; the sides which touch the ground should be covered with earth so as to close entrances which might admit the beetles. Larger frames with 6 or 8 inch boards with galvanised wires stretched across are in use in New York State and are found effective. In 1909 in British Columbia good results were obtained against the Hop Flea-beetle by spraying with whale-oil soap 1 lb., water 5 gals. Unfortunately if the beetles are abundant, constant and regular treatment of such a quickly growing crop by this means is prohibited on account of the cost, as it would have to be applied every 24 hours.

Late sowing is said to be an excellent remedy against the Turnip Flea-beetle and in central Ontario the third week in June is the best time to sow in order to avoid injury; the crops are said to be quite as good as when sown three weeks earlier.

The fact that the larvae of these flea-beetles feed upon the roots of common weeds renders clean culture very necessary, and if weeding is done about the middle of July large numbers of the grubs will be destroyed. Weeds on the margins of fields should be kept down and it is well to use land infested by such weeds for such crops as are not attacked by the adult flea-beetle. The thorough cleaning of the land after a crop is also very essential as the beetle is thus to a large extent deprived of the means of hibernation.

CHAPAI (J. C.). Un ancien ennemi de la pomme de terre. [An old enemy of the potato.]—*Le Naturaliste Canadien, Quebec, xxxix*, no. 10, April 1913, pp. 149-153.

In this paper the author discusses those members of the family MELOIDAE which attack the potato, but says that out of 16 known species only three are to be regarded as pests in the province of Quebec. These are *Epicauta cinerea*, *E. pennsylvanica* and *Macrobasis unicolor* (Ash-grey, Black, and Grey Blister Beetles respectively). These beetles lay their eggs in summer on the surface of the soil and the author gives a brief description of their metamorphosis. They generally live in large swarms, remaining but a short time in one place, and in the course of two or three days a swarm of these beetles is capable of completely defoliating a considerable crop of potatoes or tomatoes. The following is recommended as a remedy to be applied immediately that any of the beetles are seen on the crops: Sulphate of copper 4 lb., quick lime 4 lb., Paris green 4 oz., water 40 gals.; to be used as a spray. The author says that it is also possible to drive the beetles away by causing boys armed with branches to walk through the crop, brushing the plants with these as they go; the beetles in this way can be driven to one side of the field along which a line of loose straw has been placed; the insects are driven into this and it is then set on fire.

In the larval stage these insects penetrate into the oothecae of Orthoptera and eat the eggs, especially those of the Red-legged Grasshopper (*Caloptenus femur-rubrum*), and to this extent they are useful, for this insect causes much damage.

FULLER (Claude). A New Sugar-Cane Pest.—*Agric. Jl. Union of South Africa*, v, June 1913, pp. 931-933.

The author was informed by telegram that 12,000 acres of cane on the Natal Estates, Mount Edgecombe, had suddenly been attacked by a grub and that every individual cane-top had a grub in it, irrespective of the age of the cane. He found that this pest was the caterpillar of a moth, which webbed together the immature leaves forming the spike of the cane and was feeding upon the inner surface of the outermost leaf of the spike, making numerous parallel grooves in the leaf-surface. The caterpillars showed no tendency to work downwards towards the growing point of the spike or to eat through the leaves. The author arrived at the following conclusions: (1) 99 per cent. of the spikes of the "Uba" cane were infested; (2) only in rare cases was more than one caterpillar found within a spike; (3) the varieties of cane known as the "Black Seedling" and "Green Cane" were practically immune, no matter how closely planted to grossly infested areas of "Uba"; (4) individual stools of "Uba" standing in blocks of sweet cane were attacked and the sweet cane was not touched.

The author is of opinion that the damage done was not very serious although he recognises that the destruction of a certain amount of leaf tissue and the delayed activity of the enfolded

leaves is detrimental to the plant, but this he says is of such minor importance that it may be safely disregarded. The insect's chief influence is to prevent the normal unfolding of the leaves from the spike, but the growth of the plant is always sufficiently strong to cause the spike to open and break away the caterpillar's web. He found that when this occurred the caterpillar shifted to the next leaf sheathing the spike. The sweet canes are slightly attacked, and owe their comparative freedom to the nature of their growth, as they do not form so long and enfolded a spike as does the wilder "Uba." The leaves are less easily woven together and do not lend themselves to the insect's habits; further they are stronger and tear away the webs of the caterpillar very easily. Poison is out of the question, and as to cutting out the infested spikes, the author regards this as wanton destruction of 90 per cent. of the leaf-surface of the plant. The damage done in his opinion can be safely regarded as only 10 per cent. of this potential foliage. He discusses the cost of this cutting out over the whole estate attacked and endeavours to show that the loss would far outweigh the doubtful gain.

TAYLOR (H. W.). *The Production of Bright Tobacco by the Flue and Air Curing Processes.*—*Agric. Jl. Union of South Africa*, v, June 1913, pp. 880-909.

The author after dealing at length with technical agricultural and other processes concerned in the growth and preparation of tobacco, makes the following remarks on some of the more important insect pests of the plant in the Transvaal.

The Split Worm (*Phthorimaea operculella*) does most injury in the seed beds. Arsenate of lead 1 oz., in 16 gals. of water (or one large tablespoonful to 2 gals. of water) is recommended as a spray. The poison to be first thoroughly suspended in about a quart of water and this made up to 2 gals.; when properly prepared the mixture should somewhat resemble milk. When the spraying is complete and the plants dry they should have the appearance of having been whitewashed. If the larvae have entered the stems the plants should be destroyed. For Cut-worms (NOCTUIDAE) the usual poisoned bait is recommended. Wireworms (ELATERIDAE [? TENEBRIONIDAE]) enter the stalk at the surface of the soil, burrowing downwards inside it and destroying the plant. The author is not aware of any useful remedy, but thinks that winter ploughing might diminish their numbers. The attack is more serious in dry seasons than in wet. The Bud Worm (*Heliothis rhezia*).* The principal injury done in the Transvaal by the larvae of this insect is to the seed-pods, but they also attack the buds just before the flower-head appears. In preparing the seed-head for the reception of the paper bag, with which it is usually covered to prevent cross-fertilisation, any eggs found should be destroyed or the heads should be sprayed with arsenate of lead.

* [*Chloridea virescens*, F. (*rhezia*, S. & A.) is a purely American species; the insect referred to is probably *C. obsoleta*, F.—Ed.]

FULLER (Claude). The Wattle Bagworm.—*Agric. Jl. Union of S. Africa*, v, no. 6, June, 1913, pp. 838-855, 3 figs., 2 maps.

This insect (*Chaliodes junodi*, Heyl.) is a native of South Africa, and its natural food-plants are several species *Acacia*; it is widely spread in the Cape, Transvaal, and Natal. Attention was called to it by C. P. Lounsbury in the "Cape Agricultural Journal" of February 1899, and the author mentioned it as of more or less importance in nearly every wattle plantation in Natal in 1899 and 1900. Subsequent to 1900, cultivation of the wattle (*Acacia mollissima*) extended very rapidly, the area under cultivation in 1912 being ten times that in 1908. In 1909 it was reported that the pest was no worse than 12 years before, though occasionally assuming alarming proportions, but recent outbreaks in Natal have given rise to apprehension, and the increase of wattle cultivation has given the bag-worm great opportunity for extending its range. It shows great adaptability to new environments and new hosts, and may be found from very near sea-level up to altitudes of 5,000 feet, and it will readily consume guava, rose, blackberry, oak and apple, as well as the Australian acacia. Its eradication is regarded as impracticable, and all that can be done is to keep it in check and prevent its spread, though the author says that unfortunately the measures that might be taken are to a large extent impracticable to wattle-growers. Natural checks are of very great importance, large numbers being destroyed by spiders and insects before a bag is made; many are carried away by the wind; fungus pests and insect parasites assist in keeping it down, and it is largely preyed upon by the White-nosed Rat (*Mus concha*, A. Smith). Serious infestation is said not to occur until after the fourth year of growth, and there is some reason for supposing that the wind plays a part in carrying the caterpillars from one plantation to another. The author describes the elevation of the land and the general physical and climatic features of Natal at some length, and he is of opinion that in certain districts where infestation is not serious the moist warm atmosphere and the consequent ready development of bacteria and fungi has much to do with keeping the pest in check. The question of whether the bag-worm is more abundant in a dry or a wet season is difficult of decision, but the weight of evidence appears to show that dry seasons favour it.

BIGGLESTONE (H. C.). A Study of the Nesting Behaviour of the Yellow Warbler (*Dendroica aestiva aestiva*).—*Wilson Bulletin, Oberlin, Ohio*, no. 83, xxv, no. 2, June 1913, pp. 49-67.

Between 2nd July and 12th July 1912, the feeding of three nestlings of the Yellow Warbler was observed. During that time the parents made 2,373 feeding visits to the nest, bringing, amongst other articles of food, 659 green larvae, 326 fly maggots, 147 mayflies, 103 moths, 75 millers, 65 mosquitos, 26 larvae, 25 grasshoppers, 23 spiders, 18 ants, 14 grubs, 8 beetles, 4 dragon flies, 2 tree hoppers, 1 bee and 553 miscellaneous insects.

Notices of Entomological Appointments, &c.*

Mr. R. H. Deakin has been appointed as Assistant Entomologist at Nairobi, East Africa Protectorate.

Dr. A. D. Imms, late Forest Zoologist to the Government of India, has accepted a post in the University of Manchester for research work in Economic Entomology.

Mr. F. P. Jepson, Government Entomologist of Fiji, left Java in July, having been there to search for parasites of the Banana Weevil (*Cosmopolites sordidus*, Germ.).

Dr. W. A. Lamborn has been appointed as Entomologist to the Department of Agriculture, Southern Nigeria, in the place of Mr. A. Peacock (invalided).

Mr. Gilbert Storey has been appointed as Assistant Entomologist to the Egyptian Department of Agriculture.

The appointment of Mr. F. W. Urich as Entomologist to the Board of Agriculture has been renewed for a further period of two years.

The vacant Carnegie Scholarships of the Imperial Bureau of Entomology have been allotted to the following gentlemen:— Mr. R. E. McGregor, Trinity College, Cambridge, for two years; Mr. A. R. Ritchie, Glasgow University, for two years; Mr. C. Mason, South-Eastern Agricultural College, Wye, for one year; and Mr. J. W. Tothill, Assistant Entomologist, Dominion of Canada, for six months.

The Sleeping Sickness Commission of the Royal Society have arranged to send Mr. W. F. Fiske (lately of the U.S.A. Bureau of Entomology) to East Africa in September, for the purpose of studying the bionomics of *Glossina*.

* Under this heading it is proposed to publish from time to time information with regard to the appointment or movements of Economic Entomologists throughout the British Empire. It is hoped that any Entomologists concerned will be good enough to send an early notification to the Editor.

NOTICES.

The Review of Applied Entomology is intended to contain, month by month, abstracts of the latest information published concerning insects injurious to man or animals, as the carriers of disease; and to forests, fruit trees, crops or stored merchandise.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

Authors are especially requested to send to the Editor, as early as possible, copies of their papers for notice in the Review and for preservation in the Library of the Bureau, as it is hoped to form a complete collection of the literature of the subject.

Writers are also earnestly requested to send old reprints, as these are often very difficult to obtain.

Secretaries of Societies and Editors of journals willing to exchange their publications with those of the Bureau are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two Series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

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